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THE
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Perception is a word which is so well understood that it is difficult for the lexicographer to give any explanation of it. It has been called the first and most simple act of the mind, by which it is conscious of its own ideas. This definition, however, is improper, as it confounds perception with consciousness; although the objects of the former faculty are things without us, those of the latter the energies of our own minds. Perception is that power or faculty, by which, through the medium of the senses, we have the cognizance of objects distinct and apart from ourselves, and learn that we are but a small part in the system of nature. By what process the senses give us this information is one of the most interesting enquiries in metaphysics. See Metaphysics.

PERCEVAL (Spencer), second son of John, second earl of Egmont, was born in 1762, and received his education at Harrow, and Trinity College, Cambridge, of which he became a member about the year 1775. On quitting the university he entered of Lincoln's Inn, with the view of following the profession of the law at the Chancery bar. In this pursuit he soon distinguished himself, and obtained a silk gown. In 1796 he represented Northampton in parliament, and, five years after, his legal abilities and family influence raised him to the office of solicitor-general. In 1802 he was made attorney-general, and filled that situation till 1807, when, on the death of Mr. Fox, he was appointed chancellor of the exchequer. In this high post he continued till the 11th of May, 1812, when, while approaching the door of the house of commons, a person named Bellingham discharged a pistol at him in the lobby, the bullet of which, entering his breast, deprived him almost instantly of life. The assassin avowed that he had been waiting with the view of destroying lord Leveson Gower, late ambassador to the court of St. Petersburgh, for some alleged negligence of his mercantile interests, and was brought to trial on the 15th. Although a plea of insanity was set up by his counsel, he was found guilty, and executed on the 18th of the same month.

PERCH, *n. s.*, *v. n.*, & *v. a.* Fr. *perche*, *percher*; Lat. *pertica*. A rod; measure; that on which birds sit and roost: to sit or roost; place on a perch.

> He *percheth* on some branch thereby,
> To weather him and his moist wings to dry.
> *Spenser.*

> The world is grown so bad,
> That wrens make prey where eagles dare not *perch*.
> *Shakspeare.*

> The morning muses *perch* like birds and sing
> Among his branches. *Crashaw.*

> An evening dragon came,
> Assailant on the *perched* roosts,
> And nests in order ranged
> Of some villatic fowl. *Milton's Agonistes.*

> Glory, like the dazzling eagle, stood
> *Perched* on my beaver in the Granic flood;
> When fortune's self my standard trembling bore
> And the pale fates stood frighted on the shore.
> *Lee.*

> For the narrow *perch* I cannot ride. *Dryden.*

> They winged their flight aloft, then, stooping low,
> *Perched* on the double tree, that bears the golden bough. *Id.*

Let owls keep close within the tree, and not *perch* upon the upper boughs. *South.*

Perch, *n. s.* Fr. *perche*; Lat. *perca*. A fish.

The *perch* is one of the fishes of prey, that, like the pike and trout, carries his teeth in his mouth: he dare venture to kill and destroy several other kinds of fish: he has a hooked or hog-back, which is armed with stiff bristles, and all his skin armed with thick hard scales, and hath two fins on his back: he spawns but once a year, and is held very nutritive. *Walton's Angler.*

Perch, in ichthyology. See Perca.

PERCHANCE', *adv.* Per and chance. Perhaps; peradventure.

> How long within this wood intend you stay?
> —*Perchance* till after Theseus' wedding day.
> *Shakspeare.*

Finding him by nature little studious, she chose rather to endue him with ornaments of youth; as dancing and fencing, not without aim then *perchance* at a courtier's life. *Wotton.*

Only Smithfield ballad *perchance* to embalm the memory of the other. *L'Estrange.*

> Stranger, I sent for thee, for that I deemed
> Some wound was thine, that yon free band might chafe,—
> *Perchance* thy worldly wealth sunk with yon wreck—
> Such wound my gold can heal. *Maturin.*

PERCIVAL (Thomas), M. D., a physician, born at Warrington, Lancashire, in 1740, studied medicine at the universities of Edinburgh and Leyden, and returning to England, in 1765, settled at Manchester. He was the author of a variety of numerous able tracts on scientific subjects, especially Observations on the Deleterious Qualities of Lead; and Medical Ethics; A Father's Instructions to his Children; Moral and Literary Dissertations, &c.; and papers in the Transactions of the Manchester Philosophical Society, of which he was the founder and first president. He also attempted to establish public lectures on mathematics, the fine arts, and commerce, in that town; and sought to obtain support for dissenting academies at Warrington and Manchester, but was in both these last attempts unsuccessful. Dr. Percival died, highly respected both for talents and conduct, on the 30th of August, 1804. His works were published in 1807, in 4 vols. 8vo. by his son.

PERCLOSE', *n. s.* Per and close. Conclusion; last part. Obsolete.

By the *perclose* of the same verse, vagabond is understood for such an one as travelleth in fear of revengement. *Raleigh.*

PER'COLATE, *v. a.* Lat. *percolo.* To strain through.

Experiments touching the straining and passing of bodies one through another, they call *percolation.* *Bacon.*

The evidences of fact are *percolated* through a vast period of ages. *Hale's Origin of Mankind.*

Water passing through the veins of the earth is rendered fresh and portable, which it cannot be by any *percolations* we can make, but the saline particles will pass through a tenfold filtre. *Ray.*

PERCUSS', *v. a.*
PERCUSS'ION, *n. s.*
PERCU'TIENT, *adj.*
Lat. *percussio.* To strike: the act of striking; effect of sounds striking the ear: percutient being the corresponding adjective.

With thy grim looks, and
The thunder-like *percussion* of thy sounds,
Thou mad'st thine enemies shake. *Shakspeare.*

Flame *percussed* by air giveth a noise; as in blowing the fire by bellows; and so likewise flame *percussing* the air strongly. *Bacon.*

Some note, that the times when the stroke or *percussion* of an envious eye doth most hurt are when the party envied is beheld in glory. *Id.*

Inequality of sounds is accidental, either from the roughness or obliquity of the passage, or from the doubling of the *percutient.* *Id.*

In double rhymes the *percussion* is stronger. *Rymer.*

The vibrations or tremors excited in the air by *percussion* continue a little time to move from the place of *percussion* in concentric spheres to great distances. *Newton's Opticks.*

Marbles taught him *percussion* and the laws of motion, and tops the centrifugal motion. *Arbuthnot.*

PERCUSSION, in mechanics, the impression a body makes in falling or striking upon another; or the shock of two bodies in motion.

PERCY (Thomas), a learned prelate, related to the family of Northumberland, was born at Bridgenorth in Shropshire in 1728, and educated at Christ Church, Oxford, where he took his master's degree in 1753, and, on entering into orders, was presented to the vicarage of Easton Mauduit in Northamptonshire, which he held with the rectory of Wilby. In 1769 he was made chaplain to the king, in 1778 promoted to the deanery of Carlisle, and in 1782 advanced to the bishopric of Dromore in Ireland, where he died in 1811. His works are, 1. Han Kiou Chouan, a translation from the Chinese; 2. Chinese Miscellanies; 3. Five Pieces of Runic Poetry, translated from the Icelandic Language. 4. A new Translation of the Song of Solomon; 5. Reliques of Ancient English Poetry, 3 vols.; 6. A Key to the New Testament; 7. The Northumberland Household Book; 8. The Hermit of Warkworth, a poem, in the ballad style; 9. A Translation of Mallet's Northern Antiquities.

PERCY ISLES, a chain of islands in the South Pacific, near the north-east coast of New Holland. They extend from about lat. 21° 32' to 21° 45' S., and are distant about thirty miles from the main land. They were visited by Flinders in 1802, who laid down their bearings, and gave them this name of Percy Islands. The largest is about thirteen miles in circuit, and 1000 feet high. They are only occasionally visited by the Indians from the main land for turtle. The large vampyre bat was frequently found hanging by the claws, with its head downwards, under the palm trees.

PERDICCAS I., II., and III., kings of Macedonia. See MACEDON.

PERDICIUM, in botany, a genus of the polygamia superflua order, belonging to the syngenesia class of plants; and in the natural method ranking under the forty-ninth order, compositæ. The receptacle is naked; the pappus is simple; the florets bilabiate.

PERDITION, *n. s.* Fr. *perdition;* Lat. *perditio.* Destruction; death: ruin; eternal death.

While I was with hem I kept hem in thi name, thilke that thou ghauest to me I kept, and noon of hem perisschide but the son of *perdicioun.* *Wiclif. Jon.* xvii. 12.

As life and death, mercy and wrath, are matters of knowledge, all men's salvation and some men's endless *perdition* are things so opposite that whoever doth affirm the one must necessarily deny the other. *Hooker.*

Upon tidings now arrived, importing the meer *perdition* of the Turkish fleet, every man puts himself in triumph. *Shakspeare.*

Men once fallen away from undoubted truth, do after wander for ever more in vices unknown, and daily travel towards their eternal *perdition.* *Raleigh's History.*

We took ourselves for free men, seeing there was no danger of our utter *perdition,* and lived most joyfully, going abroad, and seeing what was to be seen. *Bacon.*

Quick let us part! *Perdition's* in thy presence,
And horror dwells about thee! *Addison's Cato.*

PERDIX, in ornithology, a genus of birds, belonging to the order of gallinæ, ranked by Linnæus along with the genus tetrao, or grous; but now very properly disjoined by Dr. Latham, and classed as a distinct genus, of which he describes the following characters:—The bill is convex, strong, and short; the nostrils are covered above with a callous prominent rim: the orbits are papillose; the feet naked; and most of the genus are furnished with spurs. There are forty-eight species, of which the two principal are the partridge and quail.

1. P. communis, the common partridge, is so well known, that a description of it is unnecessary, and we have not room to describe the foreign species. We refer those who wish complete information to Dr. Latham's valuable System of Ornithology. Partridges are found in every country and in every climate; as well in the frozen regions about the pole, as the torrid tracks under the equator. In Greenland, the partridge, which is brown in summer, as soon as the icy winter sets in, is clothed with a warm down beneath; and its outward plumage assumes the color of the snow among which it seeks its food. Those of Barakonda, on the other hand, are longer legged, much swifter of foot, and choose the highest rocks and precipices to reside in. They all, however, agree in one character, of being immoderately addicted to venery.

P. coturnix, or common quail, is not above half the size of the partridge. The feathers of the head are black, edged with rusty brown; the breast is of a pale yellowish red, spotted with black; the feathers on the back are marked with lines of pale yellow, and the legs are of a pale hue. Except in the colors thus described, and the size, it every way resembles a partridge in shape, and, except that it is a bird of passage, it is like all others of the poultry kind in its habits and nature. The quail seems to be an inhabitant of every climate. It is observed to shift quarters according to the season, coming north in spring, and departing in autumn, and in vast flocks. On the west coast of Naples, within four or five miles, 100,000 have been taken in a day. In England they are not numerous at any time. They feed like the partridge, and make no nest, except a few dry leaves or stalks scraped together; and sometimes a hollow on the bare ground suffices. In this the female lays six or seven eggs, of a whitish color, marked with irregular rust-colored spots: the young follow the mother as soon as hatched, like young partridges. They have but one brood in a year. Quail-fighting was a favorite amusement among the Athenians. They abstained from the flesh of this bird, deeming it unwholesome, as supposing that it fed upon the white hellebore: but they reared great numbers of them for the pleasure of seeing them fight, and staked sums of money, as we do with regard to cocks, upon the success of the combat. With us its flesh is considered as a very great delicacy. Quails are easily caught by a call.

PERDUE', *adv.* From the French *perdue* or forlorn hope: as *perdue* or advanced sentinel. Close; in ambush.

Few minutes he had lain *perdue*,
To guard his desp'rate avenue. *Hudibras.*

PERDUE BAY, a bay on the south-west coast of St. Vincent; a mile north-west of Kingston Bay.

PER'DULOUS, *adj.* Lat. *perdo.* Lost; thrown away.

There may be some wandering *perdulous* wishes of known impossibilities; as a man who hath committed an offence, may wish he had not committed it; but to chuse efficaciously and impossibly is as impossible as an impossibility. *Bramhall.*

PER'DURABLE, *adj.* Fr. *perdurable*; Lat. *perduro.* Lasting; long continued. A word not in use.

Confess me knit to thy deserving with cables of *perdurable* toughness. *Shakspeare. Othello.*

O *perdurable* shame! let's stab ourselves. *Shakspeare.*

Why should he, for the momentary trick,
Be *perdurably* fined. *Id. Measure for Measure.*

The vig'rous sweat
Doth lend the lively springs their *perdurable* heat. *Drayton.*

PERECOP, an ancient fortress in the south of the isthmus which joins the peninsula of the Crimea to the continent. It is the ancient Taphræ. In the neighbourhood are lakes, on the surface of which a great quantity of salt crystallises naturally, in May, June, and July. This salt is collected and sold to the average amount of 20,000 waggon loads yearly.

PER'EGAL, *adj.* Fr. *peregal.* Equal. Obsolete.

Whilom thou wast *peregal* to the best,
And wont to make the jolly shepherds glad;
With piping and dancing did pass the rest. *Spenser.*

PEREGRINA'TION, *n. s.* } PE'REGRINE, *adj.* } Old Fr. *peregrin*; Lat. *peregrinus.* Travel; abode abroad: peregrine, foreign; not native; not domestic.

The received opinion, that putrefaction is caused by cold or *peregrine* and preternatural heat, is but nugation. *Bacon.*

It was agreed between them, what account he should give of his *peregrination* abroad. *Id.*

It is not amiss to observe the heads of doctrine, which the apostles agreed to publish in all their *peregrinations.* *Hammond.*

That we do not contend to have the earth pass for a paradise, we reckon it only as the land of our *peregrination*, and aspire after a better country. *Bentley.*

PEREMPT', *v. a.* } PEREMP'TION, *n. s.* } Lat. *peremptus.* To kill; to crush. A law term.

Nor is it any objection, that the cause of appeal is *perempted* by the desertion of an appeal; because the office of the judge continues after such instance is *perempted.* *Ayliffe.*

This *peremption* of instance was introduced in favour of the public, lest suits should be rendered perpetual. *Id.*

PEREMP'TORY, *adj.* } PER'EMPTORILY, *adv.* } PER'EMPTORINESS, *n. s.* } Fr. *peremptoire*; barb. Lat. *peremptorius*, from *peremptus*, killed. Dogmatical; absolute; such as destroys expostulation: the adverb and noun-substantive corresponding.

He may have fifty-six exceptions *peremptorily* against the jurors, of which he shall show no cause. *Spenser.*

As touching the apostle, wherein he was so resolute and *peremptory*, our Lord Jesus Christ made manifest unto him, even by intuitive revelation, wherein there was no possibility of error. *Hooker.*

Not death himself
In mortal fury is half so *peremptory*,
As we to keep this city. *Shakspeare. King John.*

Not to speak *peremptorily* or conclusively, touching the point of possibility, till they have heard me deduce the means of the execution. *Bacon.*

If I entertaine
As *peremptorie* a desire, to levell with the plaine
A citie, where they loved to live; stand not betwixt my ire
And what it aims at. *Chapman.*

Norfolk denies them *peremptorily.* *Daniel.*

In all conferences it was insisted *peremptorily*, that the king must yield to what power was required. *Clarendon.*

Self-conceit and *peremptoriness* in a man's own opinions are not commonly reputed vices. *Tillotson.*

God's laws *peremptorily* injoin us, and the things therein implied do straitly oblige us to partake of the holy sacrament. *Kettlewell.*

Though the text and the doctrine run *peremptory* and absolute, whosoever denies Christ shall assuredly be denied by him; yet still there is a tacit condition, unless repentance intervene. *South.*

He would never talk in such a *peremptory* and discouraging manner, were he not assured that he was able to subdue the most powerful opposition against the doctrine which he taught. *Addison.*

Peremptoriness is of two sorts; the one a magisterialness in matters of opinion; the other a positiveness in relating matters of fact.
Government of the Tongue.

The more modest confess, that learning was to give us a fuller discovery of our ignorance, and to keep us from being *peremptory* and dogmatical in our determinations. *Collier.*

Some talk of letters before the deluge; but that is a matter of mere conjecture, and nothing can be *peremptorily* determined either the one way or the other. *Woodward.*

Never judge *peremptorily* on first appearances.
Clarissa.

PEREN'NIAL, *adj.* } Lat. *perennis.* Last-
PEREN'NITY, *n. s.* } ing through the year: quality of lasting through all seasons.

The matter wherewith these *perennial* clouds are raised, is the sea that surrounds them. *Harvey.*

If the quantity were precisely the same in these *perennial* fountains the difficulty would be greater.
Cheyne.

That springs have their origin from the sea, and not from rains and vapours, I conclude from the *perennity* of divers springs.
Derham's Physico-Theology.

PERENNIALS, or PERENNIAL FLOWERS, in botany, a term applied to those plants whose roots will abide many years, whether they retain their leaves in winter or not. Those which retain their leaves are called evergreens; but such as cast their leaves are named deciduous, or perdifols.

PER'FECT, *adj.* & *v. a.*
PER'FECTER, *n. s.*
PERFEC'TION,
PERFEC'TIONATE, *v. a.*
PERFEC'TIVE, *adj.*
PERFEC'TIVELY, *adv.*
PER'FECTNESS, *n. s.*
} Fr. *parfait;* Latin, *perfectus.* Complete; full; consummate; certain; due; not defective or redundant; blameless; pure: to perfect is to finish; make complete; conclude; make skilful, or fully to instruct: a perfecter is he who makes perfect: perfection and perfectness mean completeness; goodness; virtue; supreme excellence: to perfectionate, a word only used by Dryden for to advance to perfection: perfective is having the tendency to make perfect: perfectively, in such manner as brings to perfection.

If *perfeccioun* was bi the preesthood of leuy, for undir hym the peple took the lawe, what ghit was it nedeful another preest to rise bi the ordre of Melchisedech? *Wiclif. Ebrewis* vii.

Put on charity, which is the bond of *perfectness.*
Col. iii. 14.

Thou shalt be *perfect* with the Lord thy God.
Deut. xviii.

If we love one another, God dwelleth in us, and his love is *perfected* in us. 1 *John* iv. 12.

What tongue can her *perfections* tell,
In whose each part all pens may dwell? *Sidney.*

We count those things *perfect* which want nothing requisite for the end whereto they were instituted.
Hooker.

Man doth seek a triple *perfection;* first, a sensual, consisting in those things which very life itself requireth, either as necessary supplements or as ornaments thereof; then an intellectual, consisting in those things which none underneath man is capable of; lastly, a spiritual and divine, consisting in those things whereunto we tend by supernatural means here, but cannot here attain. *Id.*

Within a ken our army lies;
Our men more *perfect* in the use of arms,
Our armour all as strong, our cause the best;
Then reason wills our hearts will be as good.
Shakspeare.

Is this your *perfectness?* *Id.*

My parts, my title, and my *perfect* soul
Shall manifest me rightly. *Id. Othello.*

It is a judgment maimed and most imperfect,
That will confess *perfection* so could err
Against all rules of nature. *Id.*

Thou art *perfect* then, our ship hath touched upon
The deserts of Bohemia. *Shakspeare. Winter's Tale.*

Her cause and yours
I'll *perfect* him withal, and he shall bring you
Before the duke. *Id. Measure for Measure.*

I do not take myself to be so *perfect* in the privileges of Bohemia as to handle that part; and will not offer at that I cannot master. *Bacon.*

There is no variety in that which is *perfect,* because there is but one *perfection;* and so much shall we grow nearer to *perfectness,* by how much we draw nearer to unity and uniformity. *Bp. Hall.*

And they, so *perfect* in their misery,
Not once perceive their foul disfigurement
Milton's Comus.

Uriel, no wonder if thy *perfect* sight
See far and wide. *Milton.*

True virtue being united to the heavenly grace of faith makes up the highest *perfection.* *Id.*

Beauty now must *perfect* my renown;
With that I governed him that rules this isle.
Waller.

Praise and adoration are actions *perfective* of our souls. *More.*

Chawing little sponges dipt in oil, when *perfectly* under water, he could longer support the want of respiration. *Boyle.*

No human understanding being absolutely secured from mistake by the *perfection* of its own nature, it follows that no man can be infallible but by supernatural assistance. *Tillotson.*

An heroick poem requires, as its last *perfection,* the accomplishment of some extraordinary undertaking, which requires more of the active virtue than the suffering. *Dryden.*

Painters and sculptors, chusing the most elegant natural beauties, *perfectionate* the idea, and advance their art above nature itself in her individual production; the utmost mastery of human performance.
Id.

He has founded an academy for the progress and *perfectionating* of painting. *Id.*

Endeavour not to settle too many habits at once, lest by variety you confound them, and so *perfect* none. *Locke.*

We know bodies and their properties most *perfectly.*
Id.

Eternal life shall not consist in endless love; the other faculties shall be employed in actions suitable to, and *perfective* of their nature.
Ray on the Creation.

What toil did honest Curio take
To get one medal wanting yet,
And *perfect* all his Roman set? *Prior.*

As virtue is seated fundamentally in the intellect, so *perfectively* in the fancy; so that virtue is the force of reason in the conduct of our actions and passions to a good end. *Grew.*

Too few, or of an improper figure and dimension, to do their duty in *perfection.* *Blackmore.*

If God be infinitely holy, just, and good, he must take delight in those creatures that resemble him most in these *perfections.* *Atterbury.*

Whoever thinks a *perfect* work to see,
Thinks what ne'er was, nor is, nor e'er shall be.
Pope.

This practice was altered; they offered not to Mercury, but to Jupiter the *perfecter*. *Broome.*

The question is, not whether gospel *perfection* can be fully attained, but whether you come as near it as a sincere intention and careful diligence can carry you. *Law.*

PERFECTIBILITY, a word which we owe to the new philosophy, which made so great a noise in the first stages of the French revolution. As far as we understand, the word perfectibility is pretended, in the writings of that disastrous period, to mean the ultimate and absolute perfection to which man and society have a natural and necessary tendency; and which, we were told, neither the tyranny of kings nor the bigotry of priests could eventually restrain.

PERFECTION is divided, according to some writers, into physical, moral, and metaphysical.

1. PERFECTION, METAPHYSICAL, TRANSCENDENTAL, or ESSENTIAL, is the possession of all the essential attributes, or of all the parts necessary to the integrity of a substance: or it is that whereby a thing has or is provided of every thing belonging to its nature. This is either absolute, where all imperfection is excluded, such as the perfection of God; or secundum quid, and in its kind.

2. PERFECTION, MORAL, is an eminent degree of virtue or moral goodness, to which men arrive by repeated acts of piety, beneficence, &c. This is usually subdivided into absolute or inherent, which is actually in him to whom we attribute it; and imputative, which exists in some other, and not in him it is attributed to.

3. PERFECTION, PHYSICAL, or NATURAL, is that whereby a thing has all its powers and faculties, and those too in full vigor; and all its parts both principal and secondary, and those in their due proportion, constitution, &c., in which sense man is said to be perfect when he has a sound mind in a sound body. This perfection is by the schools frequently termed ενεργητικη, because a thing is enabled thereby to perform all its operations.

PE'RFIDY, *n. s.*
PERFID'IOUS, *adj.*
PERFID'IOUSLY, *adv.*
PERFID'IOUSNESS, *n. s.*
Fr. *perfidie*; Lat. *perfidia*. Treachery; want of faith; breach of faith: perfidious is treacherous; false to trust.

Perfidiously
He has betrayed your business, and given up,
For certain drops of salt, your city Rome.
Shakspeare.

O Judas, how happy had it been for thee, if thou hadst never done what thou *perfidiously* intendedst! *Bp. Hall.*

O spirit accursed,
Forsaken of all good, I see thy fall
Determined, and thy hapless crew involved
In this *perfidious* fraud. *Milton.*

Tell me, *perfidious*, was it fit,
To make my cream a perquisite,
And steal to mend your wages?
Widow and Cat.

They eat *perfidiously* their words,
And swear their ears through two inch boards.
Hudibras.

Some things have a natural deformity in them; as perjury, *perfidiousness*, and ingratitude.
Tillotson.

Can he not deliver us possession of such places as would put him in a worse condition, whenever he should *perfidiously* renew the war?
Swift's Miscellany.

PER'FLATE, *v. a.* Lat. *perflo*. To blow through.

If eastern winds did *perflate* our climates more frequently, they would clarify and refresh our air.
Harvey.

Miners, by *perflations* with large bellows, give motion to the air, which ventilates and cools the mines.
Woodward.

The first consideration in building of cities is to make them open, airy, and well *perflated*.
Arbuthnot on Air.

PER'FORATE, *v. a.*
PERFORA'TION, *n. s.*
Lat. *perforo*. To pierce with a tool; bore; act of boring or piercing.

Draw the bough of a low fruit tree newly budded without twisting, into an earthen pot *perforate* at the bottom, and then cover the pot with earth; it will yield a very large fruit.
Bacon's Natural History.

The likeliest way is the *perforation* of the body of the tree in several places one above another, and the filling of the holes. *Bacon.*

The industrious *perforation* of the tendons of the second joints of fingers and toes, and the drawing the tendons of the third joints through them.
More's Divine Dialogues.

A *perforated* bladder does not swell. *Boyle.*

That the nipples should be made spongy, and with such *perforations* as to admit passage to the milk, are arguments of providence.
Ray on the Creation.

The aperture was limited by an opaque circle placed between the eye-glass and the eye, and *perforated* in the middle with a little round hole for the rays to pass through to the eye. *Newton.*

The laboured chyle pervades the pores,
In all the arterial *perforated* shores. *Blackmore.*
Worms *perforate* the guts. *Arbuthnot.*

The patient, placed in a convenient chair, dipping the trocar in oil, stab it suddenly through the teguments, and, withdrawing the *perforator*, leave the waters to empty by the canula. *Sharp.*

And such in ancient halls and mansions drear
May still be seen; but *perforated* sore,
And drilled in holes, the solid oak is found,
By worms voracious eaten through and through.
Cowper.

PERFORCE', *adv.* Per and force. By violence; violently.

Guyon to him leaping, staid
His hand, that trembled as one terrified;
And though himself were at the sight dismayed,
Yet him *perforce* restrained. *Spenser.*

Jealous Oberon would have the child,
But she *perforce* withholds the loved boy.
Shakspeare.

She amaz'd, her cheeks
All trembling and arising, full of spots,
And pale with death at hand, *perforce* she breaks
Into the inmost rooms. *Peacham on Poetry.*

PERFORM', *v. a.* & *v. n.*
PERFOR'MABLE, *adj.*
PERFOR'MANCE,
PERFOR'MER, *n. s.*
Ital. *performare*, of Lat. *per* and *formo*. To execute; do; achieve; accomplish; discharge: to succeed: performable is practicable: performance, accom-

plishment of a design or promise; completion; composition; work; action: performer, he who performs; particularly, he who publickly displays his skill or ability.

I will cry unto God who *performeth* all things for me. *Psalms.*

Perform the doing of it; that as there was a readiness to will, so there may be a *performance.* 2 *Cor.* viii. 11.

Let all things be *performed* after the law of God diligently. 1 *Esdras* viii. 21.

All three set among the foremost ranks of fame for great minds to attempt, and great force to *perform* what they did attempt. *Sidney.*

Hast thou, spirit,
Performed to point the tempest that I bad thee? *Shakspeare.*

Promising is the very air o' th' time; it opens the eyes of expectation: *performance* is ever the duller for his act, and, but in the plainer kind of people, the deed is quite out of use. *Id.*

In this slumbery agitation, besides her walking and other actual *performances,* what have you heard her say? *Id.*

The merit of service is seldom attributed to the true and exact *performer.* *Id.*

Men forget the relations of history, affirming that elephants have no joints, whereas their actions are not *performable* without them. *Browne.*

Thou, my love,
Perform his funerals with paternal care. *Dryden.*

In the good poems of other men, I can only be sure, that 'tis the hand of a good master; but in your *performances* 'tis scarcely possible for to be deceived. *Id.*

The only means to make him successful in the *performance* of these great works was to be above contempt. *South.*

He effectually *performed* his part, with great integrity, learning, and acuteness; with the exactness of a scholar, and the judgment of a complete divine. *Waterland.*

When a poet has *performed* admirably in several illustrious places, we sometimes also admire his very errors. *Watts.*

Men may, and must differ in their employments; but yet they must all act for the same ends, as dutiful servants of God, in the right and pious *performance* of their several callings. *Law.*

Few of our comick *performances* give good examples. *Clarissa.*

PERFUME', *n. s.* & *v. a.* } French *parfume.*
PERFU'MER, } Strong odor of sweetness; pleasant scent: to give or impregnate with such scent: a perfumer is a dealer in perfumes.

Why rather, sleep, liest thou in smoky cribs,
And husht with buzzing night-flies to thy slumber,
Than in the *perfumed* chambers of the great,
Under the canopies of costly state,
And lulled with sounds of sweetest melody? *Shakspeare.*

Pomanders and knots of powders for drying rheums are not so strong as *perfumes*; you may have them continually in your hand, whereas *perfumes* you can take but at times. *Bacon.*

Smells adhere to hard bodies; as in *perfuming* of gloves, which showeth them corporeal. *Id.*

A moss the *perfumers* have out of apple trees, that hath an excellent scent. *Id. Natural History.*

Perfumes, though gross bodies that may be sensibly wasted, yet fill the air, so that we can put our nose in no part of the room where a perfume is burned but we smell it. *Digby.*

Even the rough rocks with tender myrtle bloom,
And trodden weeds send out a rich *perfume.* *Addison.*

Pinks and roses bloom,
And every bramble sheds *perfume.* *Gay.*

The pains she takes are vainly meant
To hide her amorous heart,
'Tis like *perfuming* an ill scent,
The smell's too strong for art. *Granville.*

No rich *perfumes* refresh the fruitful field,
Nor fragrant herbs their native incense yield. *Pope.*

See spicy clouds from lowly Sharon rise,
And Carmel's flowery top *perfumes* the skies. *Id.*

First issued from *perfumers* shops
A crowd of fashionable fops. *Swift.*

PERFUME, denotes either the volatile effluvia from any body affecting the organ of smelling, or the substance emitting those effluvia; in which last sense the word is most commonly used. The generality of perfumes are made up of musk, ambergris, civet, rose and cedar woods, orange flowers, jessamines, jonquils, tuberoses, and other odoriferous flowers. Those drugs commonly called aromatics, such as storax, frankincense, benzoin, cloves, mace, &c., enter the composition of a perfume; some are also composed of aromatic herbs, or leaves, as lavender, marjoram, sage, thyme, hyssop, &c. The use of perfumes was frequent among the Hebrews, and among the orientals in general, before it was known to the Greeks and Romans. They came to be very common among the Greeks and Romans, especially those composed of musk, ambergris, and civet. The nardus and malobathrum were held in much estimation, and were imported from Syria. The unguentum nardinum was variously prepared, and contained many ingredients. Malobathrum was an Indian plant. Perfumes were also used at sacrifices to regale the gods; at feasts, to increase the pleasures of sensation; at funerals, to overpower cadaverous smells, and please the manes of the dead; and in the theatres, to prevent the offensive effluvia proceeding from a crowd from being perceived.

PERFUNCTORILY, *adv.* Lat. *perfunctoriè.* Carelessly; negligently; so as merely to satisfy external form.

His majesty casting his eye *perfunctorily* upon it, and believing it had been drawn by mature advice, no sooner received it, than he delivered it to the lord-keeper. *Clarendon.*

Lay seriously to heart the clearness and evidence of these proofs, and not *perfunctorily* pass over all the passages of the gospel, which are written on purpose that we may believe, without weighing them. *Lucas.*

A transient and *perfunctory* examination of things leads men into considerable mistakes, which a more correct and rigorous scrutiny would have detected. *Woodward.*

Whereas all logic is reducible to the four principal operations of the mind, the two first of these have been handled by Aristotle very *perfunctorily*; of the fourth he has said nothing at all. *Baker.*

PERFUSE', *v. a.* Lat. *perfusus.* To tincture; overspread. Not used.

These dregs immediately *perfuse* the blood with melancholy, and cause obstructions. *Harvey.*

PERGAMA, the citadel of Troy; which, because of its extraordinary height, gave name to all high buildings (Servius, Virg.) Others say the walls of Troy were called Pergama.

PERGAMEA, PERGAMIA, names given by Virgil and Plutarch to Pergamum.

PERGAMO, or PERGAMOS, the modern name of Pergamum, and Pergamus.

PERGAMUM, PERGAMEA, or PERGAMIA, a town of Crete, built by Agamemnon in memory of his victory (Plut. Virg. Velleius). Here was the burying-place of Lycurgus (Aristoxenus). It was situated near Cydonia (Servius); but Scylax helps him out, who places the Dactynnean temple of Diana, which stood near Cydonia (Strabo), to the north of the territory of Pergamia.

PERGAMUM, a town of Mysia, situated on the Caicus, which runs by it (Plin. Strabo). It was the royal residence of Eumenes, and of the kings of the race of the Attali (Livy). It had an ancient temple of Æsculapius (Tacitus). The ornament of Pergamum was the royal library, vying with that of Alexandria in Egypt; the kings of Pergamum and Egypt rivalling each other in this respect (Pliny). Strabo ascribes this rivalry to Eumenes. Plutarch mentions 200,000 volumes in the library at Pergamum. Here the membranæ Pergamenæ, whence the name parchment, were invented for the use of books (Varro, Pliny). It was the country of Galen, and of Oribasius, physician to Julian (Eunapius). Here P. Scipio died (Cicero). Attalus, son of Eumenes, dying without issue, bequeathed his kingdom to the Roman people, who reduced it to a province (Strabo). Here was one of the nine conventus juridici, or assemblies of the Asia Romana, called Pergamenus, and the ninth in order, which Pliny also calls jurisdictio Pergamena.

PERGAMUS, an ancient kingdom of Asia, formed out of the ruins of the empire of Alexander the Great. It commenced about the year 283. The first sovereign was one Philetærus a eunuch, by birth a Paphlagonian, of a mean descent, and in his youth a menial servant to Antigonus, one of Alexander's captains. Philetærus left the city of Pergamus to his brother, or, according to some, to his brother's son Eumenes I., who obtained possession of the greater part of the province of Asia. Eumenes was succeeded by Attalus I., nephew of Philetærus, who, during a reign of forty-three years, was engaged in many successful wars with the Gauls, Philip of Macedon, and others. He was a man of great generosity, and such an enthusiast in favor of genius that he caused a grammarian named Daphidas to be thrown into the sea from the top of a high rock, because he spoke disrespectfully of Homer. Attalus was succeeded by his eldest son Eumenes II. He was exceedingly attached to the Romans, and assisted them in conquering Antiochus the Great, for which they rewarded him by adding to his dominions all the countries on this side of Mount Taurus, which belonged to that monarch. He continued long a faithful ally of that powerful people, but, having entered into a secret treaty with Perseus king of Macedon, he excited their resentment; and, although he sought to deprecate their vengeance, it would have fallen on him, but for his death, which happened in the thirty-ninth year of his reign. He left one son, but, as he was an infant, he nominated his brother to succeed him. Attalus II., in the beginning of his reign, was routed in a pitched battle by Prussias king of Bithynia; but the intervention of the Romans procured him complete redress. The latter part of his life he devoted to ease and luxury. He died in his eighty-second year, about 138 B. C. He was succeeded by Attalus III. the son of Eumenes, whose reign was one continued horrid scene of madness and tyranny. On his death a will was found, by which he left the Roman people heirs of all his goods; upon which they seized on the kingdom, and reduced it to a province of their empire by the name of Asia Proper. Aristonicus, a son of Eumenes by an Ephesian courtesan, endeavoured to wrest it from them, but although he gained several battles he could not attain his object, but died in prison. The country remained subject to the Romans while their empire lasted, but is now in the hands of the Turks. The city is half ruined, and is still known by the name of Pergamo.

PERGUNNAH, in the language of Hindostan, means the largest subdivision of a province, whereof the revenues are brought to one particular head cutchery, whence the accounts and cash are transmitted to the general cutchery of the province.

PERHAPS', *adv.* Per and hap. Peradventure; it may be; mayhap.

> *Perhaps* the good old man that kissed his son,
> And left a blessing on his head,
> His arms about him spread,
> Hopes yet to see him ere his glass be run.
> *Flatman.*

> Somewhat excellent may be invented, *perhaps* more excellent than the first design, though Virgil must be still excepted, when that *perhaps* takes place.
> *Dryden.*

> His thoughts inspired his tongue,
> And all his soul received a real love;
> *Perhaps* new graces darted from her eyes,
> *Perhaps* soft pity charmed his yielding soul,
> *Perhaps* her love, *perhaps* her kingdom charmed him.
> *Smith.*

> It is not his intent to live in such ways as, for ought we know, God may *perhaps* pardon, but to be diligent in such ways, as we know that God will infallibly reward. *Law.*

> A dejection of mind, which *perhaps* may be removed by to-morrow, rather disqualifies me for writing.
> *Cowper's Private Correspondence.*

PERIAGOGUE, in rhetoric, is used where many things are accumulated into one period which might have been divided into several.

PERIAGUA, a sort of large canoe made use of in the Leeward Islands, South America, and the Gulf of Mexico. It is composed of the trunks of two trees hollowed and united together; and thus differs from the canoe, which is formed of one tree.

PERIANDER, tyrant of Corinth and Corcyra, was reckoned among the seven wise men of Greece; though he might rather have been reckoned among the most wicked men, since he changed the government of his country, deprived his countrymen of their liberty, usurped the sovereignty, and committed the most shocking crimes. He committed incest with his mother, and kicked to death his wife Melissa. Yet he passed for one of the greatest politicians of his time; and Heraclides tells us that he forbad voluptuousness; that he imposed no taxes; caused all pimps to be drowned; and established a senate. He died A. A. C. 585.

PERIANTHIUM, from περι, round, and ανθος, the flower, the flower cup properly so called, the most common species of calyx, placed immediately under the flower, which is contained in it as in a cup.

PERIAPATAM, PRIYA PATANA, OR THE CHOSEN CITY, a town and domain in the Rajah's territories, Mysore, towards the borders of the Coorg country, thirty-one miles west by south from Seringapatam. This domain formerly belonged to a polygar family, named Nandirax. About 160 years ago the chief was attacked by Chica Deva Raya, the Curtur of the Mysore; and, finding himself unable to resist so powerful an enemy, he killed his wives and children, and then rushed into the midst of his enemies, where he died also. On the approach of general Abercrombie's army, in 1790, Tippoo ordered both the town and fort to be destroyed. The fortifications are now a mere ruin. The surrounding country is beautiful, but at the time it was conquered by the British did not contain one-fourth the number of inhabitants necessary for its cultivation. The natives declare they have never seen ice or snow on the top even of the highest hills. There is at Bettadapoor a hill about 4000 feet above the level of the sea. Periapatam, in time of Peace, is an entrepot of trade between the Coorg and Mysore sovereignties. Sandal wood grows in the skirts of the forests. In twelve years it attains, in a strong soil, the most suitable size for being cut. The Periapatam district produces about 2000 cwt., and the whole sandal wood of India is now in the possession of the East India Company and the rajah of Mysore. The woods are much infested, and the crops injured, by wild elephants, which are more numerous on the borders of the Coorg country than either at Chittagong or in Pegu. Among the trees is abundance also of teak.

To prepare the sandal wood, the billets are here buried in dry ground for two months, during which time the white ants eat up all the outer wood without touching the heart, which is the sandal. The deeper the color the higher the perfume, but the root sandal is the best. The large billets are sent to China, and the middle sized used. The chops, fragments, and smaller assortments, are best for the Arabian market, and from them the sandal oil is distilled.

PERIAPT, *n. s.* Gr. περιαπτω. Amulet; charm worn as a preservative against disease or mischief.

> The Regent conquers, and the Frenchmen fly:
> Now help, ye charming spells and *periapts*.
> *Shakspeare.*

PERICARDIUM, *n. s.* Fr. *pericarde*; Gr. περι and καρδια, the heart. The membrane that contains the heart.

> The *pericardium* is a thin membrane of a conic figure, that resembles a purse, and contains the heart in its cavity: its basis is pierced in five places, for the passage of the vessels which enter and come out of the heart: the use of the *pericardium* is to contain a small quantity of clear water, which is separated by small glands in it, that the surface of the heart may not grow dry by its continual motion. *Quincy.*

PERICARPIUM, *n. s.* Fr. *pericarpe*; Gr. περι and καρπος, fruit. In botany, a pellicle or thin membrane encompassing the fruit or grain of a plant, or that part of a fruit that envelopes the seed.

> Besides this use of the pulp or *pericarpium* for the guard of the seed, it serves also for the sustenance of animals. *Ray.*

PERICHORUS, in antiquity, a name given by the Greeks to those games or combats that were not consecrated to any of the gods.

PERICLES was one of the greatest men that ever flourished in Greece. He was very brave; and so eloquent that he gained almost as great an authority under the republican government of Athens as if he had been a monarch. His fondness for women was one of his chief vices. He married the celebrated Aspasia, and died the third year of the Peloponnesian war. See ATTICA.

PERICRANIUM, *n. s.* Fr. *pericrane*; from περι and *cranium*, the skull.

> The *pericranium* is the membrane that covers the skull: it is a very thin and nervous membrane of an exquisite sense, such as covers immediately not only the cranium, but all the bones of the body; except the teeth; for which reason it is also called the periosteum. *Quincy.*
>
> Having divided the *pericranium*, I saw a fissure running the whole length of the wound. *Wiseman.*

PERICULOUS, *adj.* Lat. *periculosus.* Dangerous; hazardous. A word not in use.

> As the moon every seventh day arriveth unto a contrary sign, so Saturn, which remaineth about as many years in one sign, and holdeth the same consideration in years as the moon in days, doth cause the *periculous* periods. *Browne.*

PERIGEE', *n. s.* } Fr. *perigeé*; Gr. περι
PERIGE'UM. } and γη, the earth. A point in the heavens wherein a planet is said to be in its nearest distance possible from the earth.

> By the proportion of its motion it was at the creation, at the beginning of Aries, and the *perigeum* or nearest point in Libra. *Browne.*

PERIGORD STONE, an ore of manganese, of a dark gray color, like the basaltes or trapp. It may be scraped with a knife, but is extremely difficult to be broken. It is found of no regular figure, is very compact, heavy, and as black as charcoal. Its appearance is glittering and striated, like the ore of antimony; its particles being disposed in the form of needles, crossing one another without any agglutination, insomuch that some are loose as iron filings when stuck to a loadstone; resembling the scoria from a blacksmith's furnace. By calcination it becomes harder, and of a reddish brown color, but is not magnetic. It has a considerable specific gravity, does not melt per se, but with borax runs into an amethyst-colored glass. It is scarcely affected by nitrous acid without the addition of sugar. It seems also to contain some argil and iron. It is met with in the ci-devant provinces of Gascony and Dauphiny in France, and in some parts of England. It is employed by the French potters and enamellers in the glassy varnish of their earthen wares.

PERIGRAPHE, a word used to express a careless or inaccurate delineation of any thing.

PERIGRAPHE, in anatomy, is used by Vesalius to express the white lines or impressions that appear on the musculus rectus of the abdomen.

PERIGUEUX, VESUNNA, an ancient and pretty city, the chief place of the department of Dordogne, France, having an inferior court of justice, under the royal court of Bourdeaux, a chamber of commerce, and an agricultural society. It is a bishopric, the principal place of the twentieth military division, and a post town, with 8500 inhabitants. This city stands in a fine valley, on the right bank of the isle, near the confluence of that river with the Vezère. It is encompassed with freestone walls tolerably well built, and contains several remains of ancient monuments, which show its splendor in the time of the Romans. There are some very pleasant walks round the town, and the neighbourhood abounds in excellent game and delicious truffles; Perigueux pies are also highly esteemed, and form a considerable branch of the commerce of the place. The manufactures consist of handkerchiefs, caps, fine liqueurs, &c., and the trade is chiefly in the patés, or pies, and truffles, just mentioned, together with wood, iron, grocery, brandy, game, poultry, and cattle. Here is a public library of 11,000 volumes; the prefect's house of modern construction; a botanical garden; the cathedral; the tower of Vesunna, a circular edifice, 100 feet high, without either door or window (thought to have been anciently the temple of Venus); several remains of antiquity, as an aqueduct, public baths, and several arcades of a large amphitheatre. This is the native place of Boetius and La Grange-Chancelle, celebrated authors. It is seventy-two miles S.S.W. of Limoges, ninety-six E.N.E. of Bourdeaux, fifty-seven south-east of Angoulême, and 364 S.S.W. of Paris; in long. 1° 37′ W., lat. 45° 11′ N.

PERIHE'LIUM, *n. s.* Fr. *perihelie*; Gr. περι and ηλιος, the sun. That point of a planet's orbit wherein it is nearest the sun.

Sir Isaac Newton has made it probable that the comet which appeared in 1608, by approaching to the sun in its *perihelium*, acquired such a degree of heat as to be 50,000 years a cooling.
Cheyne's Philosophical Principles.

PER'IL, *n. s.* } Fr. *peril*; Ital. *pericleo*; Lat. *periculum*. Danger; jeopardy; risk; danger denounced; denunciation: perilous is, hazardous; dangerous; and Shakspeare uses 'parlous' more than once for shrewd or witty, as Dr. Johnson thinks because of the opinion 'that children eminently forward do not live:' but query, Is it not a corruption of peerless? perilously and perilousness follow these senses.
PER'ILOUS, *adj.*
PER'ILOUSLY, *adv.*
PER'ILOUSNESS, *n. s.*

Dear Pirocles, be liberal unto me of those things which have made you indeed precious to the world, and now doubt not to tell of your *perils*. *Sidney.*

How many *perils* do unfold
The righteous man to make him daily fall!
Spenser.

Alterations in the service of God, for that they impair the credit of religion, are therefore *perilous* in common-weals, which have no continuance longer than religion hath all reverence done unto it.
Hooker.

I told her,
On your displeasure's *peril*,
She should not visit you.
Shakspeare's Winter's Tale.

A *parlous* boy, go to you are too shrewd.
Id. King Richard III.

In the act what *perils* shall we find,
If either place, or time, or other course,
Cause us to alter the order now assigned.
Daniel.

Her guard is chastity;
She that has that is clad in complete steel,
And like a quivered nymph with arrows keen
May trace huge forests and unharboured heaths,
Infamous hills and sandy *perilous* wilds. *Milton.*

Thus was the accomplished squire endued
With gifts and knowledge *per'lous* shrewd.
Hudibras.

The love and pious duty which you pay
Have passed the *perils* of so hard a way.
Dryden.

Strong, healthy, and young people are more in *peril* by pestilential fevers than the weak and old.
Arbuthnot.

Dictate propitious to my duteous ear,
What arts can captivate the changeful seer:
For *perilous* the assay, unheard the toil
T' elude the prescience of a God by guile. *Pope.*
Soldiers always live
In idleness or *peril*: both are bad. *Proctor.*

PERIM'ETER, *n. s.* Fr. *perimetre*; Gr. περι and μετρεω. The compass or sum of all the sides which bound a figure.

By compressing the glasses still more, the diameter of this ring would increase, and the breadth of its orbit or *perimeter* decrease, until another new colour emerged in the centre of the last. *Newton.*

PERINÆUM, or PERINEUM, in anatomy, the space between the anus and the parts of generation, divided into two equal lateral divisions by a very distinct line, which is longer in males than females.

PERINSKIOLD (John), a learned Swedish writer, born at Stregnesia in Sudermania, in 1654. He was made professor at Upsal, secretary antiquary of the king of Sweden, and counsellor of the chancery of antiquities. He died in 1720. His principal works are, 1. A History of the Kings of Norway. 2. A History of the Kings of the North. 3. An edition of John Messenius on the Kings of Sweden, Norway, and Denmark, in 14 vols, folio, &c.

PE'RIOD, *n. s.* & *v. a.* } Fr. *periode*; Gr. περιοδος. A circuit; time during which any thing is performed that is continued in series; course of events; a given number of years; length of time; a complete sentence; particularly the end or conclusion of a series; the point or state at which a thing terminates: as a verb to put an end to: periodic and periodical mean circular;
PERIOD'IC, *adj.*
PERIOD'ICAL,
PERIOD'ICALLY, *adv.*

regular; returning at a given period or length of time; relating to periods: periodically, at stated periods.

If my death might make this island happy,
And prove the *period* of their tyranny,
I would expend it with all willingness;
But mine is made the prologue to their play.
Shakspeare.

Your letter he desires
To those have shut him up, which failing to him,
Periods his comfort. *Id. Timon.*

Some experiments would be made how by art to make plants more lasting than their ordinary *period*, as to make a stalk of wheat last a whole year. *Bacon's Natural History.*

Periods are beautiful, when they are not too long: for so they have their strength too as in a pike or javelin. *Ben Jonson.*

Beauty's empires, like to greater states,
Have certain *periods* set, and hidden fates.
Suckling.

Light-conserving stones must be set in the sun before they retain light, and the light will appear greater or lesser, until they come to their utmost *period*. *Digby.*

Is this the confidence you gave me?
Lean on it safely, not a *period*
Shall be unsaid for me. *Milton.*

It is implicitly denied by Aristotle in his politics, in that discourse against Plato, who measured the vicissitude and mutation of states by a *periodical* fatality of number. *Browne.*

We stile a lesser space a cycle, and a greater by the name of *period*, and you may not improperly call the beginning of a large *period* the epocha thereof. *Holder on Time.*

Syllogism is made use of to discover a fallacy cunningly wrapt up in a smooth *period*. *Locke.*

There is nothing so secret that shall not be brought to light within the compass of our world; whatsoever concerns this sublunary world in the whole extent of its duration, from the chaos the last period. *Burnet's Theory.*

What anxious moments pass between
The birth of plots and their last fatal *periods!*
Oh! 'tis a dreadful interval of time. *Addison.*

The confusion of mountains and hollows furnished me with a probable reason for those *periodical* fountains in Switzerland which flow only at such particular hours of the day. *Id.*

Was the earth's *periodic* motion always in the same plane with that of the diurnal, we should miss of those kindly increases of day and night. *Derham.*

Astrological undertakers would raise men out of some slimy soil, impregnated with the influence of the stars upon some remarkable and *periodical* conjunctions. *Bentley.*

The three tides ought to be understood of the space of the night and day, then there will be a regular flux and reflux thrice in that time every eight hours *periodically*. *Broome.*

From the tongue
The unfinished *period* falls. *Thomson. Spring.*

Tell these, that the sun is fixed in the centre, that the earth with all the planets roll round the sun in their several *periods*; they cannot admit a syllable of this new doctrine. *Watts.*

For the assistance of memories, the first words of every *period* in every page may be written in distinct colours. *Id.*

Four moons perpetually roll round the planet Jupiter, and are carried along with him in his *periodical* circuit round the sun. *Watts on the Mind.*

PERIOD, in astronomy. See ASTRONOMY.

PERIOD, in chronology, denotes a revolution of a certain number of years, or a series of years, whereby, in different nations, and on different occasions, time is measured; such are the following:

1. PERIOD, CALIPPIC, a system of seventy-six years.

2. PERIOD, DIONYSIAN, or Victorian period, a system of 532 lunæ-solar and Julian years; which being elapsed, the characters of the moon fall again upon the same day and feria, and revolve in the same order, according to the opinion of the ancients. This period is otherwise called the great paschal cycle, because the Christian church first used it to find the true time of the pascha or Easter. The sum of these years arise by multiplying together the cycles of the sun and moon.

3. PERIOD, HIPPARCHUS'S, is a series of 304 solar years, returning in a constant round, and restoring the new and full moons to the same day of the solar year, according to the sentiment of Hipparchus. This period arises by multiplying the Calippic period by four. Hipparchus assumed the quantity of the solar year to be 365 *d.* 5 *h.* 55 *m.* 12*s.*; and hence concluded that in 104 years Calippus's period would err a whole day. He therefore multiplied the period by four, and from the product cast away an entire day. But even this does not restore the new and full moons to the same day throughout the whole period; but they are sometimes anticipated 1 *d.* 8 *h.* 23 *m.* 29¼ *s.*

4. PERIOD, JULIAN. See JULIAN.

PERIOD, in grammar, denotes a small compass of discourse, containing a perfect sentence, and distinguished at the end by a point, or full stop, thus (.); and in members or divisions marked by commas, colons (:), &c. Rhetoricians consider period, which treats of the structure of sentences, as one of the four parts of composition. The periods allowed in oratory are three: a period of two members, called by the Greeks dicolos, and by the Latins bimembris; a period of three members, tricols, trimembris; and a period of four, quadrimembris, tetracolos. See PUNCTUATION.

PERIOD, in medicine, is applied in certain diseases which have intervals and returns, to denote an entire course or circle of such disease; or its progress from any state through all the rest till it return to the same again. Galen describes period as a time composed of an intention and remission; whence it is usually divided into two parts, the paroxysm, or exacerbation, and remission. In intermitting fevers, the periods are usually stated and regular; in other diseases, as the epilepsy, gout, &c., they are vague or irregular.

PERIOECI, περιοικοι, in geography, such inhabitants of the earth as have the same latitudes, but opposite longitudes, or live under the same parallel and the same meridian, but in different semicircles of that meridian, or in opposite points of the parallel. These have the same common seasons throughout the year, and the same phenomena of the heavenly bodies; but, when it is noon-day with the one, it is midnight with the other, there being twelve hours in an east and west direction. These are found on the globe by the hour index, or by turning the globe half round, that is, 180° either way.

PERIOS'TEUM, *n. s.* Fr. *perioste*; Gr. περι and οςεον, a bone.

All the bones are covered with a very sensible membrane, called the *periosteum*. *Cheyne.*

PERIPATETICS, philosophers, followers of Aristotle, and maintainers of the peripatetic philosophy; called also Aristotelians. They were called Peripatetics, from περιπατεω, I walk; because they disputed walking in the Lyceum. A reformed system of the Peripatetic philosophy was first introduced into the schools in the University of Paris, whence it soon spread throughout Europe: and has subsisted in some universities to this day, under the name of school philosophy. The foundation of this is Aristotle's doctrine, often misunderstood, but oftener misapplied: whence the retainers may be denominated Reformed Peripatetics. Out of these have sprung, at various times, several branches; the chief are the Thomists, Scotists, and Nominalists. The Peripatetic system, after having prevailed with great and extensive dominion for many centuries, began rapidly to decline towards the close of the seventeenth, when the disciples of Ramus attacked it on the one hand, and it had still more formidable adversaries to encounter in Descartes, Gassendi, and Newton. See PHILOSOPHY.

PERIPATON, in antiquity, the name of that walk in the Lyceum where Aristotle taught, and whence the name of Peripatetics was given to his followers.

PERIPETIA, in the drama, that part of a tragedy wherein the action is turned, the plot unravelled, and the whole concludes. See CATASTROPHE.

PERIPH'ERY, *n. s.* Fr. *peripherie*; Gr. περιφερω. Circumference.

Neither is this sole vital faculty sufficient to exterminate noxious humours to the *periphery* or outward parts. *Harvey.*

PERIPHERY. See GEOMETRY.

PE'RIPHRASE, *v. a.* } Gr. περιφρασις; Fr. PERIPH'RASIS, *n. s.* } *periphraser*. To express one word by many; circumlocution: use of many words to express the sense of one.

She contains all bliss,
And makes the world but her *periphrasis*.
Cleaveland.

They make the gates of Thebes and the mouths of this river a constant *periphrasis* for this number seven. *Browne.*

The *periphrasis* and circumlocutions by which Homer expresses the single act of dying, have supplied succeeding poets with all their manners of phrasing it. *Pope.*

They shew their learning uselessly, and make a long *periphrasis* on every word of the book they explain. *Watts.*

PERIPLOCA, Virginian silk, in botany, a genus of the digynia order and pentandria class of plants; natural order thirtieth, contortæ. The nectarium surrounds the genitals, and sends out five filaments. There are five species, four of which are natives of warm climates, and can only be raised there. The fifth, however, is sufficiently hardy for this climate. The periploca is a fine climbing plant, that will wind itself with its ligneous branches about whatever tree, hedge, pale, or pole is near it; and will arise, by the assistance of such support, to the height of about thirty feet; and where no tree or support is at hand to wind about, it will knit or entangle itself together in a most complicated manner. The stalks of the older branches, which are most woody, are covered with a dark brown bark, whilst the younger shoots are more mottled with the different colors of brown and gray, and the ends of the youngest shoots are often of a light green. The stalks are round, and the bark is smooth. The leaves are the greatest ornament to this plant; for they are tolerably large, and of a good shining green color on their upper surface, and cause a variety by exhibiting their under surface of a hoary cast. Their figure is oblong, or rather more inclined to the shape of a spear, as their ends are pointed, and they stand opposite by pairs on short foot-stalks. Their flowers have a star-like appearance; for, though they are composed of one petal only, yet the rim is divided into segments, which expand in such a manner as to form that figure. Their inside is hairy, as is also the nectarium which surrounds the petal. Four or five of the flowers grow together, forming a kind of umbel. They are of a chocolate color, are small, and are in blow in July and August, and sometimes in September. In the country where this genus grows naturally they are succeeded by a long taper pod, with compressed seeds having down to their tops. The propagation of this climber is very easy; for if the cuttings are planted in a light moist soil, in the autumn or in the spring, they will readily strike root. Three joints at least should be allowed to each cutting; they should be the bottom of the preceding summer's shoot; and two of the joints should be planted deeply in the soil. Another, and a never-failing method, is by layers; for if they are laid down in the ground, or a little soil only loosely thrown over the young preceding summer's shoots, they will strike root at the joints, and be good plants for removing the winter following.

PERIPNEU'MONY, *n. s.* } Gr. περι and PERIPNEUMO'NIA, *n. s.* } πνευμων, the lungs; Fr. *peripneumonie*. Inflammation of the lungs.

Lungs oft imbibing phlegmatick and melancholick humours are now and then deprehended schirrous, by dissipation of the subtiler parts, and lapidification of the grosser that may be left indurated, through the gross reliques of *peripneumonia* or inflammation of the lungs. *Harvey.*

A *peripneumony* is the last fatal symptom of every disease; for nobody dies without a stagnation of the blood in the lungs, which is the total extinction of breath. *Arbuthnot.*

PERIPNEUMONY, a disease attended with an acute fever, and a difficulty of breathing. See MEDICINE.

PERIRRHANTERIUM, a vessel of stone or brass, which was filled with holy water, and with which all those were sprinkled who were admitted by the ancients to their sacrifices. Beyond this vessel no profane person was allowed to pass. It was used both by Greeks and Romans, and has been evidently borrowed by the church of Rome. The Hebrews also had a vessel for purification.

PERISCII, in geography, the inhabitants of either frigid zone, between the polar circles and the poles, where the sun, when in the summer signs, moves only round about them, without setting; and consequently their shadows in the same day turn to all the points of the horizon.

PER'ISH, *v. n.* & *v. a.*
PER'ISHABLE, *adj.*
PER'ISHABLENESS, *n. s.*
Fr. *perir*; Port. and Span. *perecer*; Lat. *pereo*. To die; be destroyed; come to nothing; be lost; be in a state of constant decay; be eternally lost: as an active verb (obsolete) to destroy; cause to decay: perishable and perishableness follow the senses of the verb neuter, which generally takes *for* or *with* before a cause. and *by* before an instrument.

They *perish* quickly from off the good land. *Deut.* xi. 18.

If I have seen any *perish for* want of cloathing, then let mine arm fall from my shoulder blade. *Job* xxxi. 29.

I *perish with* hunger. *Luke* xv. 17.

These, as natural brute beasts made to be destroyed, speak evil of the things they understand not, and shall utterly *perish*. 2 *Peter*.

I burn, I pine, I *perish*,
If I atchieve not this young modest girl. *Shakspeare*.

The splitting rocks cowered in the sinking sands,
And would not dash me with their ragged sides;
Because thy flinty heart, more hard than they,
Might in thy palace *perish* Margaret. *Id.*

We derogate from his eternal power to ascribe to them the same dominion over our immortal souls, which they have over all bodily substances and *perishable* natures. *Raleigh*.

Rise, prepared in black, to mourn thy *perished* lord. *Dryden*.

Characters drawn on dust, that the first breath of wind effaces, are altogether as useful as the thoughts of a soul that *perish* in thinking. *Locke*.

Exposing their children, and leaving them in the fields to *perish by* want, has been the practice. *Id.*

Duration, and time which is a part of it, is the idea we have of *perishing* distance, of which no two parts exist together, but follow in succession; as expansion is the idea of lasting distance, all whose parts exist together. *Id.*

Suppose an island separate from all commerce but having nothing because of its commonness and *perishableness* fit to supply the place of money: what reason could any have to enlarge possessions beyond the use of his family? *Id.*

To these purposes nothing can so much contribute as medals of undoubted authority not *perishable* by time, nor confined to any certain place. *Addison*.

He was so reserved, that he would impart his secrets to nobody; whereupon this closeness did a little *perish* his understanding. *Collier*.

Human nature could not sustain the reflection of having all its schemes and expectations to determine with this frail and *perishable* composition of flesh and blood. *Rogers*.

So when the lust of tyrant power succeeds,
Some Athens *perishes*, or some Tully bleeds. *Pope*.

Familiar now with grief your ears refrain,
And in the public woe forget your own,
You weep not for a *perished* lord alone. *Id.*

Thrice has he seen the *perishable* kind
Of men decay. *Id. Odyssey*.

It is a prince's greatest present felicity to reign in their subjects' hearts; but these are too *perishable* to preserve their memories, which can only be done by the pens of faithful historians. *Swift*.

PERISTAL'TIC, *adj.* Gr. περιστελλω, to contract; Fr. *peristaltique*. Contractile in the particular manner described below.

Peristaltick motion is that vermicular motion of the guts, which is made by the contraction of the spiral fibres, whereby the excrements are pressed downwards and voided. *Quincy*.

The *peristaltick* motion of the guts, and the continual expression of the fluids, will not suffer the least matter to be applied to one point the least instant. *Arbuthnot*.

PERISYS'TOLE, *n. s.* Gr. περι and συστολη. In medicine, the pause or interval betwixt the two motions of the heart or pulse; namely, that of the systole or contraction of the heart, and that of diastole or dilatation.

PER'ISTYLE, *n. s.* Fr. *peristile*. A circular range of pillars.

The Villa Gordiana had a *peristyle* of two hundred pillars. *Arbuthnot on Coins*.

PERITONE'UM, *n. s.* Fr. *peritoine*; Gr. περιτοναιον. A membrane that lies immediately under the muscles of the lower belly, and which encloses all the bowels there contained.

Wounds penetrating into the belly are such as reach no farther inward than to the *peritoneum*. *Wiseman*.

PERITONEUM. See ANATOMY, Index.

PERITONIUM, a town of Egypt, on the west bank of the Nile, reckoned one of the keys of the country. Marc Antony was defeated near it by Cornelius Gallus, a lieutenant of Augustus.

PERITROCHIUM, in mechanics, denotes a wheel or circle, concentric with the base of a cylinder, and moveable together with it about its axis.

PER'JURE, *v. a.* & *n. s.*
PER'JURER, *n. s.*
PER'JURY.
Lat. *perjuro*. To forswear; swear falsely; taint with perjury, used with the reciprocal pronoun: it is used as a noun substantive by Shakspeare, and for perjurer, which signifies one who swears falsely: perjury is false swearing; a false oath.

The law is not made for a righteous man, but for the lawless and disobedient, for *perjured* persons. 1 *Tim.* i. 10.

The common oath of the Scythians was by the sword and fire; for that they accounted those two special divine powers, which should work vengeance on the *perjurers*. *Spenser*.

Hide thee, thou bloody hand,
Thou *perjure*, thou similar of virtue,
Thou art incestuous. *Shakspeare. King Lear*.

Who should be trusted now, when their right hand
Is *perjured* to the bosom? *Shakspeare*.

My great father-in-law, renowned Warwick,
Cried aloud--What scourge for *perjury*
Can this dark monarchy afford false Clarence?
And so he vanished. *Id. Richard III.*

Let us consider, that rash and vain swearing is very apt often to bring the practiser of it into that most horrible sin of *perjury*. *Barrow*.

PERJURY, in law, is defined by Sir Edward Coke to be a crime committed when a lawful oath is administered, in some judicial proceeding, to a person who swears wilfully, absolutely, and falsely, in a matter material to the issue or point in question. In ancient times it was in some places punished with death; in others it made the false swearer liable to the punishment due to the crime he had charged the innocent person with; in others a pecuniary mulct was imposed.

PER'IWIG, *n. s.* & *v. a.* Fr. *perruque*. False hair worn by way of ornament or concealment of baldness: to dress in false hair.

Her hair is auburn, mine is perfect yellow;
If that be all the difference in his love,
I'll get me such a coloured *periwig*. *Shakspeare.*

It offends me to hear a robusteous *periwig*-pated fellow tear a passion to tatters, to split the ears of the groundlings. *Id.*

Now when the winter's keener breath began
To crystallise the Baltic Ocean,
To glaze the lakes, to bridle up the floods,
And *periwig* with snow the bald-pate woods.
Sylvester.

The sun's
Dishevelled beams and scattered fires
Serve but for ladies *periwigs* and tires
In lovers' sonnets. *Donne.*

For veiling of their visages his highness and the marquiss bought each a *periwig*, somewhat to overshadow their foreheads. *Wotton.*

Madam Time, be ever bald,
I'll not thy *periwig* be called. *Cleaveland.*

They used false hair or *periwigs*. *Arbuthnot.*

From her own head Megara takes
A *periwig* of twisted snakes. *Swift.*

Near the door an entrance gapes,
Crowded round with antick shapes,
Discord *periwig'd* with snakes,
See the dreadful strides she takes.
Id. Miscellanies.

PER'IWINKLE, *n. s.* Barb. Lat. *pervinca* (from its winding shape.) A small shell-fish; a fish snail; also a winding plant, the clematis.

Thetis is represented by a lady of a brownish complexion, her hair dishevelled about her shoulders, upon her head a coronet of *periwinkle* and escalop shells. *Peacham.*

There are in use, for the prevention of the cramp, bands of green *periwinkle* tied about the calf of the leg. *Bacon.*

The common simples with us are comfry, bugle, ladies' mantle, and *periwinkle*. *Wiseman's Surgery.*

PERIZONIUS (James), a learned and laborius writer, born at Dam in 1651. He became professor of history and eloquence at the university of Franekir, when, by his merit and learning, he made that university flourish. However, in 1693, he went to Leyden, where he was made professor of history, eloquence, and Greek; in which employment he continued till his death, in 1715. He wrote many learned and curious works, particularly Origines Babylonicæ et Egyptiacæ, 2 vols. 8vo., &c. But his work most generally known is the Notes upon Sancta Minerva.

PERIZZITES, ancient inhabitants of Palestine, mingled with the Canaanites. They did not inhabit any certain portion of the land of Canaan; there were some of them on both sides the river Jordan, in the mountains, and the plains.

PERK, *v. n.*, *v. a.* & *adj.* From *perch*, Skinner. To hold up the head with affected briskness; assume airs; dress smartly or proudly: pert; brisk; proud.

My ragged ronts
Wont in the wind, and wag their wriggle tails,
Peark as a peacock, but nought avails. *Spenser.*

'Tis better to be lowly born,
And range with humble livers in content,
Than to be *perked* up in a glist'ring grief,
And wear a golden sorrow.
Shakspeare. Henry VIII.

If, after all, you think it a disgrace,
That Edward's miss thus *perks* it in your face;
To see a piece of failing flesh and blood,
In all the rest so impudently good;
Faith, let the modest matrons of the town
Come here in crouds, and stare the strumpet down.
Pope.

PERKINISM, in medicine, is a late and already exploded method of curing head-aches, rheumatisms, quinsies, gouts, lumbagos, cramps, contusions, sprains, tumors, burns, scalds, erysipelas, palsies, and various other diseases and pains in all parts of the body, by drawing metallic tractors over the parts affected; invented by a Dr. Perkins of America. These tractors were made of silver, brass, copper, iron, lead, or zinc; and even of ivory or ebony; and supposed to act as mechanical stimuli, or as galvanic conductors of electricity. Experiments are said to have been made with success in this way by other physicians and surgeons, particularly Dr. J. C. Tode, physician to the king of Denmark, and professors Herholdt and Rafn, of Copenhagen, who published a Treatise on Perkinism, and first made use of the term.

PER'LOUS, *adj.* Corrupted from perilous. Dangerous; hazardous.

A *perlous* passage lies,
Where many maremaids haunt, making false melodies. *Spenser.*

Late he fared
In Phædria's fleet bark over the *perlous* shard.
Id.

PERM, an extensive government, situated chiefly in European, but partly in Asiatic Russia, adjacent to that of Viatka on the west, and Tobolsk on the east; extending from 56° to 62° of N. lat. Its area is 116,000 square miles, or double that of England, while its population does not exceed 1,100,000. It is intersected from north to south by a part of the great Ural chain, and is in general hilly, covered with vast and impenetrable forests. It is divided into twelve districts or circles. Those situated in the south-east are tolerably cultivated, but the rest of the country is fit only for pasture; and an annual import of corn is generally necessary. The exports are cattle, and the copper, iron, and salt of the mines. The inhabitants are a mixed race, partly Russian, and partly Finnish and Tartar. The annual export of metal is computed at 2000 tons of copper, and 70,000 tons of iron. The sea being remote both on the north and south of the rivers; those on the west side of the Ural chain flow into the Kama, which joins the Wolga; those on the east side fall, for the most part, into the Oby, the outlet of which is in the Frozen Ocean. The forests contain various animals, which are hunted for their furs. The inhabitants are partly Christians, partly Mahometans, and, in no inconsiderable degree, Pagans. The ancestors of those of the country between the White Sea and the Ural Mountains are described as a wealthy and powerful nation; but after falling, in the middle ages, under the sway of the republic of Novgorod, they were gradually incorporated into the Russian empire.

PERM, the chief place of the preceding government, is situated on the river Kama, and has some neat public buildings, a public school, and an hospital. It carries on an active traffic with the provinces both to east and west, in the metals of the surrounding country. Population 3800: 910 miles east by south of St. Petersburg, and 720 E. N. E. of Moscow.

PERMACOIL, a town and fortress of the Carnatic, south of India. The fort is situated on a rock from 200 to 300 feet high, and from 400 to 500 yards in breadth. It was first taken by the British in 1760, then made over to the nabob of Arcot, and in the year 1782 was captured by the united forces of Hyder Aly and the French. It remained with them till the end of the war, when it was dismantled, and the fortifications blown up. Long. 79° 52′ E., lat. 12° 13′ N.

PER'MANENCE, or PER'MANENCY, *n. s.* PER'MANENT, *adj.* PER'MANENTLY, *adv.* PERMAN'SION, *n. s.* } Lat. *permanens*, *permaneo*. Duration; abidance; consistency; continuity of state: permanent is lasting; durable; unchanged; the adverb corresponding: permansion (obsolete), continuance.

If the authority of the maker do prove unchangeableness in the laws which God hath made, then must all laws which he hath made be necessarily for ever *permanent*, though they be but of circumstance only. *Hooker.*

Should I dispute whether there be any such material being that hath such a *permanence* or fixedness in being? *Hale.*

Although we allow that hares may exchange their sex sometimes, yet not in that vicissitude it is presumed; from female into male, and from male to female again, and so in a circle without a *permansion* in either. *Brown's Vulgar Errours.*

That eternal duration should be at once is utterly unconceivable, and that one *permanent* instant should be commensurate or rather equal to all successions of ages. *More.*

Salt, they say, is the basis of solidity and *permanency* in compound bodies, without which the other four elements might be variously blended together, but would remain uncompacted. *Boyle.*

It does, like a compact or consistent body, deny to mingle *permanently* with the contiguous liquor. *Id.*

His meaning is, that in these, and in such other light injuries, which either leave no *permanent* effect or only such as may be borne without any great prejudice, we should exercise our patience. *Kettlewell.*

Pure and unchanged, and needing no defence
From sins, as did my frailer innocence;
Their joy sincere, with no more sorrow mixt,
Eternity stands *permanent* and fixt. *Dryden.*

From the *permanency* and immutability of nature hitherto, they argued its *permanency* and immutability for the future. *Burnet.*

Such a punctum to our conceptions is almost equivalent to *permanency* and rest. *Bentley.*

PER'MEABLE, *adj.* PERMEA'TION, *n. s.* } Lat. *permeo*. Such as may be passed through.

It entereth not the veins, but taketh leave of the *permeant* parts at the mouth of the meseraicks. *Browne.*

The pores of a bladder are not easily *permeable* by air. *Boyle.*

This heat evaporates and elevates the water of the abyss, pervading not only the fissures, but the very bodies of the strata, *permeating* the interstices of the sand, or other matters whereof they consist. *Woodward's Natural History.*

PERMIS'CIBLE, *adj.* PERMIS'TION, *n. s.* PERMIX'TION. } Latin, *permisceo*. Capable of being mingled or mixed: permistion and permixtion mean the act of mixing or mingling; state of being mingled.

They fell into the opposite extremity of one nature in Christ, the divine and human natures in Christ, in their conceits, by *permixtion* and confusion of substances, and of properties growing into one upon their adunation. *Brerewood.*

PERMIT', *v. a.* & *n. s.* PERMIS'SIBLE, *adj.* PERMIS'SION, *n. s.* PERMIS'SIVE, *adj.* PERMIS'SIVELY, *adv.* PERMIT'TANCE, *n. s.* } Fr. *permettre*; Ital. *parmettere*; Lat. *permitto*. To yield; allow; suffer; resign; let; not hinder: a permit is a legal excise ticket of sufferance, or allowance for goods to pass from a place, having paid the duty imposed on them: permissible is allowable; what may be permitted: permission and permittance, allowance; forbearance of opposition; grant of liberty: permissive, granting liberty; not hindering; allowing without upbraiding: permissively, by way of allowance or forbearance to hinder; by bare allowance.

Women keep silence in the churches, for it is not *permitted* unto them to speak. 1 *Cor.* xiv. 34.

What things God doth neither command nor forbid, the same he *permitteth* with approbation either to be done or left undone. *Hooker.*

We bid this be done,
When evil deeds have their *permissive* pass,
And not the punishment. *Shakspeare.*

As to a war for the propagation of the christian faith, I would be glad to hear spoken concerning the lawfulness, not only *permissively*, but whether it be not obligatory to Christian princes to design it. *Bacon's Holy War.*

If this doth authorise usury, which before was but *permissive*, it is better to mitigate usury by declaration, than to suffer it to rage by connivance. *Id. Essays.*

Clad
With what *permissive* glory since his fall
Was left him, or false glitter. *Milton's Paradise Lost.*

With thy *permission* then, and thus forewarned,
The willinger I go. *Milton.*

Hypocrisy, the only evil that walks
Invisible, except to God alone
By his *permissive* will, through heaven and earth. *Id.*

Nor love thy life, nor hate; but what thou livest,
Live well; how long, how short, *permit* to heaven. *Id.*

If the course of truth be *permitted* unto itself, it cannot escape many errours.
Browne's Vulgar Errours.

You have given me your *permission* for this address, and encouraged me by your perusal and approbation.
Dryden.

Ye gilded ghosts, *permit* me to relate
The mystick wonders of your silent state. *Id.*
To the gods *permit* the rest. *Id.*
Whate'er can urge ambitious youth to fight,
She pompously displays before their sight;
Laws, empire, all *permitted* to the sword. *Id.*

We should not *permit* an allowed, possible, great and weighty good to slip out of our thoughts, without leaving any relish, any desire of itself there.
Locke.

Let us not aggravate our sorrows,
But to the gods *permit* the events of things.
Addison.

When this system of air comes, by divine *permittance*, to be corrupted by poisonous acrimonious steams, what havock is made in all living creatures!
Derham's Physico-Theology.

After men have acquired as much as the laws *permit* them, they have nothing to do but to take care of the publick. *Swift.*

The officers, in their *permits* for removing exciseable goods, shall express as well the time for which they shall be in force for removing such goods, as the time within which they shall be received into stock by the person to whom they are sent; and if not removed within the time limited (unavoidable accidents excepted), or, in default of such removing, if the *permit* shall not be returned to the officer who granted the same, the person procuring the *permit* shall forfeit treble value of the goods: and if not received into stock, within the time limited, by the person to whom they were *permitted* to be sent, they shall be deemed goods removed without a *permit*.
21 *Geo.* III. c. 55.

PERMUTATION, *n. s.* Fr. *permutation*; Lat. *permutatio*. Exchange of one for another.

Gold and silver, by their rarity, are wonderfully fitted for the use of *permutation* for all sorts of commodities. *Ray.*

A *permutation* of number is frequent in languages.
Bentley.

PERNAMBUCO, a province of Brasil, bounded by the Atlantic Ocean north and east, south by Bahia, and east by a desert territory. It is about 470 miles in extent from north to south, and about 370 from east to west; abounding in sugar-cane, cotton, and Brasil wood. The climate is in the interior hot and moist. Hides, cocoa-nuts, ipecacuanha, and a few other drugs, are sent hence; but its chief exports are cotton and sugar. The imports are manufactured goods, earthenware, and other articles of necessity among civilised people. Vessels from the United States arrive at Recife annually, bringing flour, of which great quantities are now consumed, furniture for dwelling houses, and other kinds of lumber; and carrying away sugar, molasses, and rum. The trade to the coast of Africa for slaves is also considerable. During the war between the United States and England, which interrupted this trade, Recife was sometimes distressed for wheat-flour, but a supply was received from Rio Grande.

PERNAMBUCO, or St. Antonio do Recife, a town of Brasil, capital of the province of this name. It consists of three divisions, Recife, St. Antonio, and Boa Vista; the first two of which are situated on two sand-banks, surrounded by the sea, and connected together by a bridge of stone and wood lined with shops; this renders it so narrow that two carriages cannot pass abreast.

The harbour of Recife, called the Mosqueiro, situated on the outward bank, is formed by a reef of rocks which runs parallel with the town, at a small distance. The lower harbour, for vessels of 400 tons and upwards, called the Poco, is dangerous, as it is open to the sea; and the beach opposite is very steep. The port has two entrances: the tide does not rise more than five feet and a half. The principal defence of the town consists in the forts Do Buraco and Do Brum, both built of stone, and situated upon the sands opposite to the two entrances. There is likewise the small fort of Bom Jezus, near to the archway and church of the same name; and upon the south-east point of the sand-bank of St. Antonio stands the large stone fort of Cinco Pontas, but they all are said to be out of order.

The division of Recife, which is that nearest the sea, stands on a long narrow neck of land, which stretches southward from the foot of the hill on which the town of Olinda, about a league distant, is built. In front of this bank runs a reef of rocks. At full tide the waves roll over it; but, being checked by this barrier, they strike the quays and buildings of the town with diminished strength. The second sand-bank, on which is placed the division called St. Antonio, is connected with Boa Vista, situated on the continent, by a narrow wooden bridge. Buildings have only been raised within the protection of the reef. The tide enters between the bridges, and encircles the middle compartment. The view from the houses that look on these waters is very extensive and beautiful; the opposite banks being covered with trees and white-washed cottages, varied by small open spaces and lofty cocoa trees. The Recife division of the town is composed of brick houses, of from three to five stories in height; most of the streets are narrow, but they are paved. In the square is the custom house, a low and shabby building; the sugar-inspection house; a large church, and a coffee-house, in which the merchants assemble to transact commercial affairs. There are two churches in use, one of which is built over the stone arch-way leading from the town to Olinda. Near to this is a small fort, close to the water side, which commands it. To the north is the residence of the port-admiral, with the government timber-yards. The cotton-market, warehouses, &c., are also in this part of the town.

St. Antonio, or the middle town, is composed chiefly of large lofty houses and broad streets. The ground floors are appropriated to shops, warehouses, &c., without windows, the only light they have being admitted from the door; and there exists very little distinction of trades. Here is the governor's palace, once the Jesuits' convent; the treasury; town-hall, and prison; the barracks; the Franciscan, Carmelite, and Penha convents, and several churches, handsomely ornamented. The principal street of Boa Vista is broad and handsome. The rest of this third division consists chiefly of small houses, extending at intervals to some distance. A long embankment has been made, which connects the sand-bank and town of St. Antonio with the main land to the south and west of Boa Vista. The river Capibaribe discharges its waters into the channel between.

Pernambuco, since the ports of Brasil were thrown open to foreign commerce, has been constantly increasing in opulence. The three divisions of the town contain together about 25,000 inhabitants.

PERNICIOUS, *adj.* } Fr. *pernicieux*; Lat.
PERNIC'IOUSLY, *adv.* } *perniciosus*. Mis-
PERNIC'IOUSNESS, *n. s.* } chievous; destructive; ruinous; the adverb and noun substantive corresponding.

Some wilful wits wilfully against their own knowledge, perniciously against their own conscience, have taught. *Ascham.*

To remove all out of the church, whereat they shew themselves to be sorrowful, would be, as we are persuaded, hurtful, if not *pernicious* thereunto. *Hooker.*

I call you servile ministers,
That have with two *pernicious* daughters joined
Your high engendered battles, 'gainst a head
So old and white as this. *Shakspeare. King Lear.*

All the commons
Hate him *perniciously*, and wish him
Ten fathom deep. *Id. Henry VIII.*

Now, if we were to judge of the several kinds of science by this rule, we should find, 1. Some of them to be very hurtful and *pernicious*. *Mason.*

PERNI'CIOUS, *adj.* } Lat. *pernix*. Quick;
PERNIX, } swift: quickness; cele-
PERNIX'ITY, *n. s.* } rity. Dr. Johnson says, 'A use which I have found only in Milton, and which, as it produces an ambiguity, ought not to be imitated;' yet he supplies the example of the noun substantive from Ray.

Part incentive reed
Provide, *pernicious* with one touch to fire. *Milton.*

Others armed with hard shells, others with prickles, the rest that have no such armature endued with great swiftness or *pernicity*. *Ray on the Creation.*

PERNIO, a kibe or chilblain, is a little ulcer, occasioned by cold in the hands, feet, heels, nose, and lips. It will come on when warm parts are too suddenly exposed to cold, or when parts from being too cool are suddenly exposed to a considerable warmth; and has always a tendency to gangrene, in which it frequently terminates. It most commonly attacks children of a sanguine habit and delicate constitution; and may be prevented or removed by such remedies as invigorate the system, and are capable of removing any tendency to gangrene in the constitution.

PERONES, a sort of high shoes which in early times were worn even by senators; but at last were confined to ploughmen and laborers. They were very rudely formed, consisting only of hides undressed, and reaching to the middle of the leg. Virgil mentions the perones as worn by a company of rustic soldiers on one foot only.

PERORATION, *n. s.* Lat. *peroratio*. The conclusion of an oration.

What means this passionate discourse?
This *peroration* with such circumstances? *Shakspeare.*

True women to the last—my *peroration*
I come to speak in spite of suffocation. *Smart.*

PERORATION, in rhetoric, consists of two parts. 1. Recapitulation; wherein the substance of what was diffused throughout the whole speech is collected briefly and cursorily, and summed up with new force and weight. 2. The moving the passions; which is so peculiar to the peroration that the masters of the art call this part sedes affectuum. See ORATORY.

PEROTIS, in botany, a genus of the digynia order, belonging to the triandria class of plants; and in the natural method ranking under the fourth order, gramina. There is no calyx: the corolla consists of a bivalvular glume; the valves are oblong, acute, somewhat unequal, and terminating in a sharp beard: it has three capillary stamina; the antheræ incumbent; the style capillary, and shorter than the corolla; the stigma feathery and divaricated. The corolla serves as a perianthium, including a single seed of an oblong linear shape. Of this there is only one species; viz. P. plumosus, a native of America.

PEROUSE (John Francis Galaup, de la) a French navigator, distinguished for his mysterious fate, was born at Albi, in Languedoc, in 1741, and entered at an early age into the naval service. During the American war he had the command of an expedition to Hudson's Bay; and, on the restoration of peace, the French government having determined on a voyage of discovery, M. de la Perouse was fixed on to command it. Two vessels, the Boussole and the Astrolabe, were placed under his direction; and, leaving France in 1785, proceeded to the South Sea. Having visited the coast of California, he crossed the Pacific, to continue his researches on the coasts and islands of Asia. In April, 1787, he sailed from Manilla towards the north; and at length, on the 6th of September, arrived at the harbour of St. Peter and St. Paul, Kamtschatcha. Here he stayed to refit the ships, and experienced the utmost hospitality from the local authorities. The commander had also the satisfaction to receive letters from France, informing him that he had been promoted to the rank of commodore, which event the governor of Kamtschatcha celebrated by a salute of artillery. From St. Peter and St. Paul Perouse sent copies of his journals, &c., to France, by M. de Lesseps, who proceeded over land across Siberia; and on the 30th of September the vessels sailed. They crossed the equinoctial line, without meeting with any land till the 6th of December, when they saw the Navigators' Islands, and a few days after landed at Maouna. Here M. de Langle, the captain of the Astrolabe, Lamanon, the naturalist attached to the expedition, and ten other persons, were killed in an unprovoked attack of the natives. After this Perouse visited Oyolava, and then steered for the coast of New Holland; and, on the 26th January, 1788, anchored in Botany Bay, at the time governor Philip, with the whole of the colonists, was sailing out to Port Jackson. The French did not leave Botany Bay until March, when the commodore wrote, stating his intention to continue his researches till December, when he expected to arrive at the Isle of France. This was the latest direct intelligence received of him; and M. d'Entrecasteaux, who was despatched by the French government, in 1791, in search of Perouse, was unable to trace the course he had taken. Recently, however, a notice has been published by the French minister of marine, purporting that an American captain had declared that he had seen, in the hands of one of the natives of an island between Louisiade and New Caledonia, a cross of the order of St. Louis, and some medals, which appeared to have been procured from La Perouse's vessels. In consequence of this information, the commander of a vessel which sailed from Toulon, in April 1826, received orders to make researches in the quarter specified. Other intelligence, relative to the wreck of two large vessels, on two different islands of the New Hebrides, was obtained by our captain Dillon at Tucopia, in his passage from Valparaiso to Pondicherry, in May 1826, in consequence of which that officer has been despatched to the New Hebrides to ascertain the authenticity of the report he received. The voyage of La Perouse was published in French at Paris, 1797, 4 vols. 4to; and an English translation, in 3 vols. 8vo., appeared in 1798.

PERPEND', *v. a.* Lat. *perpendo.* To weigh exactly; weigh in the mind; consider attentively.

Thus it remains and the remainder thus;
Perpend. *Shakspeare. Hamlet.*

Perpend, my princess, and give ear. *Shakspeare.*

Consider the different conceits of men, and duly *perpend* the imperfection of their discoveries. *Browne.*

Unto reasonable *perpensions* it hath no place in some sciences. *Browne's Vulgar Errours.*

PERPENDIC'ULAR, *adj.* } Fr. *perpendi-*
PERPENDIC'ULARLY, *adv.* } *culaire*; Lat.
PERPENDICULAR'ITY, *n. s.* } *perpendicularis.*
Crossing at right angles; particularly crossing the horizon at right angles: perpendicularity is the state of being perpendicular.

Ten masts attacht make not the altitude,
Which thou hast *perpendicularly* fallen.
Shakspeare.

Some define the *perpendicular* altitude of the highest mountains to be four miles. *Browne.*

Irons refrigerated north and south, not only acquire a directive faculty, but if cooled upright and *perpendicularly*, they will also obtain the same.
Browne's Vulgar Errours.

Shoot up an arrow *perpendicularly* from the earth, the arrow will return to your foot again. *More.*

All weights naturally move *perpendicularly* downward. *Ray.*

The angle of incidence, is that angle which the line, described by the incident ray, contains with the *perpendicular* to the reflecting or refracting surface at the point of incidence. *Newton's Opticks.*

Though the quantity of water thus rising and falling, be nearly constant as to the whole, yet it varies in the several parts of the globe; by reason that the vapours float in the atmosphere, and are not restored down again in a *perpendicular* upon the same precise tract of land. *Woodward.*

The meeting of two lines is the primary essential mode or difference of an angle; the *perpendicularity* of these lines is the difference of a right angle.
Watts's Logic.

If in a line oblique their atoms rove,
Or in a *perpendicular* they move;
If some advance not slower in their race,
And some more swift, how could they be entangled? *Blackmore.*

PE'RPETRATE, *v. a.* } Fr. *perpetrer*; Lat.
PERPETRA'TION, *n. s.* } *perpetro.* To commit; act: almost always used in an ill sense: but see the extract from Butler.

A desperate discontented assassinate, would, after the *perpetration*, have honested a mere private revenge. *Wotton.*

Success, the mark no mortal wit,
Or surest hand can always hit;
For whatsoe'er we *perpetrate*,
We do but row, we're steered by fate.
Hudibras.

My tender infants or my careful sire,
These they returning will to death require,
Will *perpetrate* on them the first design,
And take the forfeit of their heads for mine.
Dryden.

The forest, which, in after times,
Fierce Romulus, for *perpetrated* crimes,
A sacred refuge made. *Id.*

Hear of such a crime
As tragick poets, since the birth of time,
Ne'er feigned a thronging audience to amaze;
But true, and *perpetrated* in our days.
Tate's Juvenal.

A woman who lends an ear to a seducer may be insensibly drawn into the *perpetration* of the most violent acts. *Clarissa.*

PERPET'UAL, *adj.* } Fr. *perpetuel, perpe-*
PERPET'UALLY, *adv.* } *tuer*; Ital., Span., and
PERPET'UATE, *v. a.* } Lat. *perpetuo.* Inces-
PERPETU'ITY, *n. s.* } sant; uninterrupted; eternal, with respect to futurity: always operating: perpetually, the corresponding adverb: to perpetuate is to preserve from extinction or decay; to eternise; continue without cessation: perpetuation, the act of making, and perpetuity, the state of being, perpetual.

For men to alter those laws, which God for *perpetuity* hath established, were presumption most intolerable. *Hooker.*

Yet am I better
Than one that's sick o' the gout, since he had rather
Groan so in *perpetuity*, than be cured
By the sure physician, death.
Shakspeare. Cymbeline.

Time as long again
Would be filled up with our thanks;
And yet we should, for *perpetuity*,
Go hence in debt. *Id. Winter's Tale.*

Nothing wanted to his noble and heroical intentions, but only to give *perpetuity* to that which was in his time so happily established. *Bacon.*

The strokes of divine vengeance, or of men's own consciences, always attend injurious *perpetrations.*
King Charles.

A *perpetual* screw hath the motion of a wheel and the force of a screw, being both infinite.
Wilkins's Mathematical Magick.

Within those banks rivers now
Stream, and *perpetual* draw their humid train.
Milton.

Nourishing hair upon the moles of the face is the *perpetuation* of a very ancient custom. *Browne.*

There can be no other assurance of the *perpetuity* of this church, but what we have from him that built it. *Pearson.*

What is it, but a continued *perpetuated* voice from heaven, resounding for ever in our ears? to give men no rest in their sins, no quiet from Christ's importunity, till they awake from their lethargick sleep, and arise from so mortiferous a state, and permit him to give them life. *Hammond.*

Under the same moral, and therefore under the same *perpetual* law. *Holyday.*

A cycle or period begins again as often as it ends, and so obtains a *perpetuity.* *Holder.*

Mine is a love, which must *perpetual* be,
If you can be so just as I am true. *Dryden.*

This verse is every where sounding the very thing in your ears; yet the numbers are *perpetually* varied, so that the same sounds are never repeated twice. *Id.*

What the gospel enjoins is a constant disposition of mind to practise all Christian virtues, as often as time and opportunity require; and not a *perpetuity* of exercise and action; it being impossible at one and the same time to discharge variety of duties. *Nelson.*

The ennobling property of the pleasure, that accrues to a man from religion, is, that he that has the property, may be also sure of the *perpetuity.* *South.*

Medals, that are at present only mere curiosities, may be of use in the ordinary commerce of life, and at the same time *perpetuate* the glories of her majesty's reign. *Addison.*

In passing from them to great distances, doth it not grow denser and denser *perpetually*; and thereby cause the gravity of those great bodies towards one another? *Newton's Optics.*

The laws of God as well as of the land
Abhor a *perpetuity* should stand;
Estates have wings, and hang on fortune's power. *Pope.*

The bible and common prayer-book in the vulgar tongue, being *perpetually* read in churches, have proved a kind of standard for language, especially to the common people. *Swift.*

Man cannot devise any other method so likely to preserve and *perpetuate* the knowledge and belief of a revelation so necessary to mankind. *Forbes.*

O ye blest scenes of permanent delight!
Full above measure! lasting beyond bound!
A *perpetuity* of bliss is bliss. *Young.*

PERPIGNAN, Ruscino, an ancient, large, and strong post town, and the principal place of the department of the Eastern Pyrenees, France, containing 15,800 inhabitants. It has an inferior court of judicature, under the royal court of Montpellier, a chamber of commerce, a mint, a superintendency of the customs, an agricultural society, a society of arts, a communal college, and a school for drawing architectural. This town is pleasantly situated on the right bank of the Tet, at its junction with the Baisse. It is built at the foot and on the declivity of a hill, which overlooks a magnificent plain, to the west of which rises the Canigon, one of the highest of the Pyrenean mountains; to the north the Corbieres mountains; to the east the sea, hidden by a range of verdant hills, and to the south the road to Catalonia. The temperature is quite warm: at a few leagues from the town the orange grows in the open field, and even in the valley, in which it stands; the olive trees form immense orchards, extending to the foot of the Canigou; so that while this mountain rears its peak, covered with snow, its base is clothed with the richest produce of the south. The town, though not well built, presents an agreeable aspect; there are several fine public buildings in it, and some fine walks recently planted.

This place is of the greatest importance, as it forms the pass from Roussillon into Catalonia. Its fortifications, considerably augmented by Vauban, were almost entirely renewed in 1823; and the citadel, so situated as to command the town, has been rendered very strong, and capable of resisting successive attacks. At different periods Perpignan has sustained sieges, which put the constancy and courage of its inhabitants to the severest trial. The most memorable of these was in 1475, under Louis XI., which has been compared to those of Saguntum and Numantia; for eight months the people suffered all the horrors of famine, and at last the place was taken by storm. It was besieged without success in 1542, in the reign of Francis I., by an army of 400,000 men. In 1642 Louis XIII. took it after a siege of three months. This is the native town of Carrere, the celebrated physician, and the painter Rigaud.

Here are manufactures of cloth, woollen stuffs, lace, cork, and leather; and a trade is carried on in Rivesalses wines, brandy, grain, oil, fine wool, iron, silk, corks, &c. There is a very flourishing fold here, in which are 150 Thibetian goats. The public places are the library, containing 13,000 volumes, the cabinets of natural history and philosophy, the place d'armes, a grand rectangle, one side of which is occupied by barracks capable of containing 5000 men; the royal square, the town-hall, the justice-hall, the beautiful walk between the glacis of the town and the watering canal, the bridge over the Tet and the citadel, where there is a very deep well to which you descend by a flight of stairs; it is supplied by a fountain, inexhaustible in the greatest droughts. Perpignan is eighty-one miles south-east of Carcassone, forty-five south of Narbonne, thirty-three east of Prades, twenty-four north-west of Port-Vendre, and 705 south of Paris, in long. 0° 34′ E., lat. 42° 42′ N.

PERPLEX′, *v. a.* & *adj.*
PERPLEX′EDLY, *adv.*
PERPLEX′EDNESS, *n. s.*
PERPLEX′ITY.
Fr. *perplex*; Ital. *perplesso*; Lat. *perplexus.* To embarrass; entangle; distract; torment; vex; involve; make intricate; complicate: as an adjective, intricate; complicated; difficult; but perplexed is the modern and better word: perplexedly and perplexedness follow the senses of the adjective: perplexedness and perplexity mean embarrasment; intrication; involution of affairs or of mind.

Being greatly *perplexed* in his mind, he determined to go into Persia. 1 *Mac.* iii. 31.

The fear of him ever since hath put me into such *perplexity*, as now you found me. *Sidney.*

The royal virgin, which beheld from far,
In pensive plight and sad *perplexity*,
The whole atchievement of this doubtful war,
Came running fast to greet his victory. *Spenser.*

Perplexity not suffering them to be idle, they think and do, as it were, in a phrensy. *Hooker.*

Themselves with doubts the day and night *perplex.* *Denham.*

Their way
Lies through the *perplexed* paths of the drear wood. *Milton.*

How the soul directs the spirits for the motion of the body, according to the several animal exigents, is *perplex* in the theory. *Glanville's Scepsis.*

Let him look for the labyrinth; for I cannot discern any, unless in the *perplexity* of his own thoughts. *Stillingfleet.*

He *perplexes* the minds of the fair sex with nice speculations of philosophy, when he should engage their hearts. *Dryden.*

I ask whether the connection of the extremes be not more clearly seen, in this simple and natural disposition, than in the *perplexed* repetitions and jumble of five or six syllogisms? *Locke.*

What was thought obscure, *perplexed*, and too hard for our weak parts, will lie open to the understanding in a fair view. *Id.*

Obscurity and *perplexedness* have been cast upon St. Paul's Epistles, from without. *Id.*

We both are involved
In the same intricate *perplext* distress. *Addison.*

Chloe's the wonder of her sex,
'Tis well her heart is tender,
How might such killing eyes *perplex*,
With virtue to defend her. *Granville.*

My way of stating the main question is plain and clear; yours obscure and ambiguous: mine is fitted o instruct and inform; yours to *perplex* and confouud a reader. *Waterland.*

Hard task! for one who lately knew no care,
And harder still as learned beneath despair;
His hours no longer pass unmarked away,
A dark importance saddens every day;
He hears the notice of the clock, *perplexed*,
And cries, Perhaps eternity strikes next. *Cowper.*

PER'QUISITE, *n. s.* } Lat. *perquisitus.*
PER'QUISITED, *adj.* } Something above regular wages or gains: supplied with perquisites.

But what avails the pride of gardens rare,
However royal, or however fair,
If *perquisited* varlets frequent stand,
And each new walk must a new tax demand?
Savage.

Tell me, perfidious, was it fit
To make my cream a *perquisite*,
And steal to mend your wages?
Widow and Cat.

To an honest mind, the best *perquisites* of a place are the advantages it gives a man of doing good. *Addison.*

To what your lawful *perquisites* amount. *Swift.*

PERQUISITE, in law, is any thing gotten by a man's own industry, or purchased with his money; in contradistinction to what descends to him from his father or other ancestor.

PERRAULT (Charles), son of an advocate in parliament, was born at Paris, in 1626. Colbert chose him first clerk of the buildings, of which he was superintendant, and afterwards made him comptroller-general of the finances under him. He was one of the first members of the academy of belles lettres and inscriptions, and was received into the French academy in 1671. His poems La Peinture, and La siecle de Louis le Grand, are well known. He drew up elegies of great men of the seventeenth century, with portraits, and produced other esteemed works.

PERRAULT (Claude), brother of Charles, was born at Paris in 1613; and was bred a physician, though he never practised but among his relations, friends, and the poor. He excelled in architecture, painting, sculpture, mathematics, physics, and all those arts that relate to designing and mechanics. When the academy of sciences was established, he was one of its first members, and was chiefly depended on for mechanics and natural philosophy. His works are, A French translation of Vitruvius; Memoires pour servir à l' Histoire Naturelle des Animaux, fol. 1676, with figures; Essais de Phisique, 4 vols. 12mo, 1688; Recueil des Plusieurs Machines de nouvelle Invention, 4to. 1700, &c. He died in 1688.

PERRAULT (Nicholas and Peter), brothers of the two last, made themselves also known in the literary world.

PERRON (James Davy Du), a cardinal distinguished by his abilities and learning, born in Bern, in 1556; and educated by Julian Davy, his father, a very learned Calvinist. Philip Desportes, abbot of Tyron, made him known to Henry III. king of France, who conceived a great esteem for him. Some time after Du Perron abjured Calvinism, and embraced the ecclesiastical function. After the murder of Henry III. he retired to the house of cardinal de Bourbon, and took great pains in bringing back the Protestants to the church of Rome. He chiefly contributed to engage Henry IV. to change his religion: and that prince sent him to negociate his reconciliation to the holy see, in which he succeeded. Du Perron was consecrated bishop of Evreux while he resided at Rome. He was made cardinal in 1604 by pope Clement VIII. at the solicitation of Henry IV. who afterwards nominated him to the archbishopric of Sens. He also sent him to Rome with cardinal Joyense, in order to terminate the disputes between Paul V. and the Venetians. He died at Paris in 1618. His works were collected after his death, and published at Paris in 3 vols. folio.

PERROT (Nicholas), lord of Ablancourt, a man of uncommon genius, born at Chalons in 1606. After studying philosophy about three years he was sent to Paris to follow the law. At eighteen years of age he was admitted advocate of parliament, but soon discontinued his practice. In 1637 he was admitted a member of the French academy; he died in 1664. His works are mostly translations.

PERRUKE, PERUKE, or PERIWIG, was anciently a name for a long head of natural hair; such, particularly, as there was care taken in the adjusting and trimming of. The Latins called it coma; whence part of Gaul took the denomination of Gallia Comata, from the long hair which the inhabitants wore as a sign of freedom. The word is now used for a set of false hair, curled, buckled, and sewed together on a frame or cawl; anciently called capillamentum or 'false peruke.' The ancients used false hair, but the use of perukes, in their present mode, has not existed two centuries.

PERRY, *n. s.* Fr. *poirè*, from *poire*; Belg. *peerdranck*. Cyder made of pears.

Perry is the next liquor in esteem after cyder, in the ordering of which, let not your pears be over ripe before you grind them; and with some sorts of pears, the mixing of a few crabs in the grinding is of great advantage, making *perry* equal to the redstreak cyder. *Mortimer.*

PERRY, the best pears for perry are those which are most tart and harsh. Of these the Bosbury pear, the Bareland pear, and the horse pear, are the most esteemed for perry in Worcestershire, and the squash pear in Gloucestershire.

PERRY (Captain John), an engineer, who resided long in Russia, having been recommended to the czar Peter, while in England, as a person capable of serving him on a variety of occasions relating to his new design of establishing a fleet, making his rivers navigable, &c. He was author of The State of Russia, 1716, 8vo., and An Account of the stopping of Dagueham Breach, 1721, 8vo. He died February 11th, 1733.

PERRY (James), an English journalist, was born at Aberdeen, October 30th, 1756. After receiving his education in the high school of that place, he was entered of the Marischal College, with a view to the law; but the failure of his father, who was a builder, put an end to that design, and in 1774 he went successively to Edinburgh and to Manchester, as a mercantile clerk; but in 1777 he pushed on in quest of fortune to London. Here he became a writer in The General Advertiser, which paper prospered well under his management. In 1782 he became the first editor of The European Magazine, in which he had Dr. William Thomson for a coadjutor, though the work did not answer till Mr. Isaac Reed undertook the management. Mr. Perry now engaged in conducting The Gazetteer, and was also the editor of Debrett's Parliamentary Debates. At length he purchased The Morning Chronicle, which paper made his fortune. He died at Brighton, December 4th, 1821. He was twice the object of a public prosecution, once for publishing the Resolutions of the Derby Meeting; and secondly, for a paragraph respecting his present majesty, then prince of Wales. On the former occasion he was defended by lord Erskine; on the latter he pleaded his own cause with great ability, and both times obtained a verdict of acquittal. For many years the Morning Chronicle, under the management of Mr. Perry, might be deemed a sort of official organ of the Whig opposition, a feature which it immediately lost on his death.

PER'SECUTE, *v. a.*
PERSECU'TION, *n. s.*
PERSECUTOR.
Fr. *persecuter*, of Lat. *persecutus*; Ital. *persequire*; Span. and Port. *persequir*; of barb. Lat. *persequi*. To pursue intently; hence malignantly; harass with penalties; importune: the nouns follow these senses.

Our necks are under *persecution*; we labour and have no rest. *Lamentations* v. 5.

The Jews raised *persecution* against Paul and Barnabas, and expelled them. *Acts* xiii. 50.

I *persecuted* this way unto the death. *Id.* xxii.

They might have fallen down, being *persecuted* of vengeance, and scattered abroad. *Wisdom* xi. 20.

Heavy *persecution* shall arise
On all, who in the worship severe
Of spirit and truth. *Milton.*

What man can do against them not afraid,
Though to the death; against such cruelties
With inward consolations recompensed;
And oft supported so, as shall amaze
Their proudest *persecutors*. *Id. Paradise Lost.*

He endeavoured to prepare his charge for the reception of the impending *persecution*; that they might adorn their profession, and not at the same time suffer for a cause of righteousness, and as evil doers. *Fell.*

Relate,
For what offence the queen of heaven began
To *persecute* so brave, so just a man. *Dryden.*

Christian fortitude and patience had their opportunity in times of affliction and *persecution*. *Sprat.*

The deaths and sufferings of the primitive Christians had a great share in the conversion of those learned Pagans, who lived in the ages of *persecution*. *Addison.*

Henry rejected the pope's supremacy, but retained every corruption besides, and became a cruel *persecutor*. *Swift.*

PERSECUTION, in a more restrained sense, is the sufferings of Christians on account of their religion. Historians usually reckon ten general persecutions, the first of which was under the emperor Nero, thirty-one years after our Lord's ascension; when that emperor, having set fire to the city of Rome, threw the odium of that execrable action on the Christians, who under that pretence were wrapped up in the skins of wild beasts and worried and devoured by dogs; others were crucified, and others burnt alive. The second was under Domitian, in the year 95. In this persecution, St. John the apostle was sent to the isle of Patmos, in order to be employed in digging in the mines. The third began in the third year of Trajan, in the year 100, and was carried on with great violence for several years. The fourth was under Antoninus the philosopher, when the Christians were banished from their houses, forbidden to show their heads, reproached, beaten, hurried from place to place, plundered, imprisoned, and stoned. The fifth began in the year 197, under the emperor Severus. The sixth began with the reign of the emperor Maximinus in 235. The seventh, which was the most dreadful persecution that had ever been known in the church, began in the year 250, in the reign of the emperor Decius, when the Christians were in all places driven from their habitations, stripped of their estates, tormented with racks, &c. The eighth began in the year 257, in the fourth year of the reign of Valerian. The ninth was under the emperor Aurelian, A. D. 274; but this was very inconsiderable; and the tenth began in the nineteenth year of Dioclesian, A. D. 303. In this dreadful persecution, which lasted ten years, houses filled with Christians were set on fire, and whole droves were tied together with ropes, and thrown into the sea.

PERSEPOLIS, formerly the capital of Persia, situated in N, lat. 30° 30′ E., long. 84°; now in ruins, but still remarkable for the most magnificent remains of a palace or temple that are now perhaps to be found in the world. This city stood in one of the finest plains in Persia, being eighteen or nineteen leagues in length, and in different places, two, four, or six leagues in breadth. It is watered by the great river Araxes, now Bendemir, and by a multitude of rivulets besides. Within the compass of this plain are between 1000 and 1500 villages, all adorned with pleasant gardens, and planted with shady trees. The entrance of this plain on the west side has received as much grandeur from nature, as the city it covers could do from industry or art. It consists of a range of mountains steep and high, four leagues in length, and about two miles broad, forming two flat banks, with a rising terrace in the middle, the summit of which is perfectly plain and even, all of native rock. In this there are such openings, and the terraces are so fine and so even, that one would be tempted to think the whole the work of art, if the great extent, and prodigious elevation thereof, did not convince one that it is a wonder too great for aught but nature to produce. Undoubtedly these banks were the very place where the advanced guards from Persepolis took post, and from which Alexander found it so difficult to dislodge them. One cannot from hence descry the ruins of the city, because the banks are too high to be overlooked: but one can perceive on every side the ruins of walls and of edifices, which heretofore adorned the range of mountains of which we are speaking. On the west and on the north this city is defended in the like manner: so that, considering the height and evenness of these banks, one may safely say that there is not in the world a place so fortified by nature.

The mountain Rehumut, in the form of an amphitheatre, encircles the palace, which is one of the noblest and most beautiful pieces of architecture remaining of all antiquity. Authors and travellers have been exceedingly minute in their descriptions of these ruins; and yet some of them have expressed themselves so differently from others, that, had they not agreed with respect to the latitude and longitude of the place, one would be tempted to suspect that they had visited different spots. These ruins have been described by Garcias de Silva Figueroa, Pietro de la Valle, Chardin, Le Brun, and Mr. Franklin. We shall adopt the description of the latter, as being exceedingly distinct, and given by a traveller intelligent and unassuming.

The ascent to the columns is by a grand staircase of blue stone containing 104 steps. The first objects that strike the beholder on his entrance are two portals of stone, about fifty feet in height each; the sides are embellished with two sphinxes of an immense size, dressed out with a profusion of bead work, and, contrary to the usual method, they are represented standing. On the sides above are inscriptions in an ancient character, the meaning of which no one hitherto has been able to decipher.

At a small distance from these portals you ascend another flight of steps, which lead to the grand hall of columns. The sides of this staircase are ornamented with a variety of figures in basso-relievo; most of them have vessels in their hands; here and there a camel appears, and at other times a kind of triumphal car, made after the Roman fashion; besides these are several led horses, oxen, and rams, that at times intervene and diversify the procession. At the head of the staircase is another basso-relievo, representing a lion seizing a bull; and close to this are other inscriptions in ancient characters. On getting to the top of this staircase, you enter what was formerly a most magnificent hall; the natives have given this the name of chehul minar, or forty pillars; and, though this name is often used to express the whole of the building, it is more particularly appropriated to this part of it. Although a vast number of ages have elapsed since the foundation, fifteen of the columns yet remain entire; they are from seventy to eighty feet in height, and are masterly pieces of masonry: their pedestals are curiously worked, and appear little injured by the hand of time. The shafts are enfluted up to the top, and the capitals are adorned with a profusion of fret-work. From this hall you proceed along eastward, until you arrive at the remains of a large square building, to which you enter through a door of granite. Most of the doors and windows of this apartment are still standing; they are of black marble, and polished like a mirror: on the sides of the doors, at the entrance, are bassi-relievi of two figures at full length; they represent a man in the attitude of stabbing a goat: with one hand he seizes hold of the animal by the horn, and thrusts a dagger into his belly with the other; one of the goat's feet rests upon the breast of the man, and the other upon his right arm. This device is common throughout the palace. Over another door of the same apartment is a representation of two men at full length; behind them stands a domestic holding a spread umbrella: they are supported by large round staffs, appear to be in years, have long beards, and a profusion of hair upon their heads. At the south-west entrance of this apartment are two large pillars of stone, upon which are carved four figures; they are dressed in long garments, and hold in their hands spears ten feet in length. At this entrance also the remains of a staircase of blue stone are still visible. Vast numbers of broken pieces of pillars, shafts, and capitals are scattered over a considerable extent of ground, some of them of such enormous size that it is wonderful to think how they could have been brought whole and set up together. Indeed, all the remains of these noble ruins indicate their former grandeur and magnificence, truly worthy of being the residence of a great and powerful monarch.

These noble ruins are now the shelter of beasts and birds of prey. Besides the inscription abovementioned, there are others in Arabic, Persian, and Greek. Dr. Hyde observes that the inscriptions are very rude and artless; and that some, if not all of them, are in praise of Alexander the Great; and therefore are later than that conqueror.

PERSES, the last king of Macedonia. See Macedon.

PERSEVERE', *v. n.* PERSEVE'RANCE, *n. s.* PERSEVE'RANT, *adj.* } Fr *persevérer*; Ital. *perseverare*; Span. and Port. *perseverar*; Lat. *persevero*. To persist; continue; be constant in a design or attempt: perseverance is persistence; continuance; constancy in good or ill: perseverant, constant; persisting.

> But my rude musick, which was wont to please
> Some dainty ears, cannot with any skill
> The dreadful tempest of her wrath appease,
> Nor move the dauphin from her stubborn will;
> But in her pride she doth *persevere* still. *Spenser.*

> The king-becoming graces
> Bounty, *perseverance*, mercy, lowliness,
> I have no relish of them. *Shakspeare. Macbeth.*

They hate repentance more than *perseverance* in a fault. *King Charles.*

We place the grace of God in the throne, to rule and reign in the whole work of conversion, *perseverance*, and salvation. *Hammond.*

Thrice happy, if they know
Their happiness, and *persevere* upright! *Milton.*

Thus beginning thus we *persevere*;
Our passions yet continue what they were.
Dryden.

Wait the seasons of Providence with patience and *perseverance* in the duties of our calling, what difficulties soever we may encounter. *L'Estrange.*

To *persevere* in any evil course makes you unhappy in this life, and will certainly throw you into everlasting torments in the next. *Wake.*

Patience and *perseverance* overcome the greatest difficulties. *Clarissa.*

And *perseverance* with his battered shield. *Brooke.*

Perseverance, in theology, a continuance in a state of grace to a state of glory. About this subject there has been much controversy in the Christian church. All divines, except Unitarians, admit that no man can ever be in a state of grace without the co-operation of the Spirit of God; but the Calvinists and Arminians differ widely as to the nature of this co-operation. The former, at least such as call themselves the true disciples of Calvin, believe that those who are once under the influence of divine grace can never fall totally from it, or die in mortal sin. The Arminians, on the other hand, contend that the whole of this life is a state of probation; that without the grace of God we can do nothing that is good; that the Holy Spirit assists, but does not overpower our natural faculties; and that a man, at any period of his life, may resist, grieve, and even quench the Spirit. See Theology.

PERSEUS, in fabulous history, the son of Jupiter by Danae, the daughter of king Acrisius. See Acrisius and Danae. Many miracles are related of this hero by the poets. Having engaged to bring the head of Medusa to Polydectes king of Seriphos, who had educated him, Minerva gave him her shield, Mercury lent him his wings and caduceus, with his dagger made of diamonds called herpe; and Pluto lent him his helmet, which rendered him invisible. Thus equipped, Perseus flew through the air, visited the Graiæ, and their sisters the Gorgons; killed Medusa, and brought away her head; gave birth to Pegasus and Chrysaor from her blood; turned the giant Atlas into a mountain by a sight of her head; killed the sea monster that was going to devour Andromeda; married that princess; changed her uncle Phineus and his troops, who were going to carry her off from him, into stones; and made the same metamorphosis upon Polydectes when he was going to ravish Danae. Having afterwards killed his grandfather Acrisius accidentally, by throwing a quoit, he refused to succeed him in the throne of Argos, and exchanged it for that of Tirynthus; after which he founded the city of Mycenæ, of which he became king, and where he and his posterity reigned for 100 years. He flourished, according to most chronologists, in 1348 B.C.; but according to Sir Isaac Newton only in 1028.

Perseus, in astronomy. See Astronomy.

Perseus. See Macedon. This unfortunate monarch left a daughter and two sons, Philip and Alexander. The latter was bred a carpenter, but, having acquired some learning, became secretary to the senate of Rome.

PERSHORE, or Pearshore, an ancient market town of Worcestershire, is situated on the north side of the river Avon, 103 miles northwest by west from London, on the direct road to Worcester. It consists of two parochial divisions; viz. the vicarage of St. Andrew, and the chapelry of Holy Cross. Pershore is a town of great antiquity, and is said to have derived its name from the number of pear-trees which grow in its vicinity. According to bishop Tanner, Oswald, a nephew of Ethelred, king of Mercia, founded a monastery here in 689; but William of Malmsbury asserts that Egelward, duke of Dorset, in the reign of Edgar, was the first founder. Gough, in his additions to Camden, only accounts for the discrepancy, by stating that it was considerably enlarged and increased in its endowments by Egelward. It became an abbey of Benedictine monks, dedicated at first to the blessed Virgin and the apostles Peter and Paul, but afterwards to St. Edburga. Belonging to the abbey was a large church, called the Holy Cross, 280 feet in length, and 120 broad. Of the abbey itself there are but few vestiges; but the church has been repaired, and used for parochial purposes. It has a lofty square tower, and contains several old monuments. In ancient times, the principal approach to the abbey was through Lice Street, a Saxon appellation derived from the corpses for interment being carried along that street. A small part of the gateway on the north side is still in existence; near it was the chapel of St. Edburga, a daughter of king Edward the Elder. Pershore has at present two churches, that of Holy Cross abovementioned, and All Saints, which is small, but neat, and has a square tower. The town consists principally of one street, about three-quarters of a mile in length, and has many respectable houses. The manufacture of stockings is the chief pursuit of the inhabitants. It formerly sent members to parliament, but none have been returned since the 23d of Edward I. It has a market on Tuesday, and three annual fairs.

PERSIA, a most ancient and celebrated empire of Asia, the limits of which have been variously stated. At present, according to Sir William Jones, Persia is the name of only one province of this extensive empire, which, by the natives, and all the learned Mussulmans in India, is called Iràn. The same learned writer is confident that Iràn, or Persia in its largest extent, formerly comprehended within its outline the lower Asia.

Of Ancient Persia.—The most ancient name of this country was Elam, or Ælam, from Elam the son of Shem, from whom its first inhabitants are descended. Herodotus calls its inhabitants Cephenes; and in very ancient times the people are said to have called themselves Artæi, and the country where they dwelt Artæa. In the books of Daniel, Esdras, &c., it is called by the names of Pars, Pharas, or Fars, whence the modern name of Persia; but whence those names have been derived is now uncertain. That Persia was originally peopled by Elam, the son of Shem, has been very generally admitted; but the ancient history of this distinguished empire is very little known. The first Persian monarch of whom any thing is known with tolerable accuracy was the great Cyrus, although it is evident that a powerful monarchy had subsisted in Iràn for ages before the accession of that hero; that this monarchy was called the Mahébédian dynasty; and that it was in fact the oldest monarchy in the world.

Cyrus is celebrated both by sacred and profane historians; but the latter are at no small variance concerning his birth and accession to the throne. The stories told by Herodotus of Astyages, the last king of the Medes, being alarmed by his dreams; of his endeavouring to prevent their fulfilment by marrying his daughter, Mandane, to a mean Persian; of his afterwards ordering his grandson Cyrus to be murdered; of his preservation by Harpagus, and of Astyages's barbarous revenge by murdering Harpagus's son, and serving up his mangled limbs to Harpagus at a dinner; and of Harpagus's conspiring with Cyrus to dethrone his grandfather; with Astyages's deposition and imprisonment; have all very much the air of a fable. According to Xenophon, Cyrus was the son of Cambyses, king of Persia, and Mandane the daughter of Astyages king of Media. He was born a year after his uncle Cyaxares, the brother of Mandane. He lived till the age of twelve with his parents in Persia, being educated after the manner of the country, and inured to fatigues and military exercises. At this age he was taken to the court of Astyages, where he resided four years, when the revolt of the Medes and Persians from the Babylonians happened. See BABYLONIA. While Cyrus was employed in the Babylonish war, before he attacked the metropolis itself, he reduced all the nations of Asia Minor. The most formidable of these were the Lydians, whose king Crœsus assembled a very numerous army, composed of all the other nations in that part of Asia, as well as of Egyptians, Greeks, and Thracians. This vast army, consisting of 420,000 men, Cyrus routed at the battle of Thymbra, and next day took Sardis, the capital of Lydia. See CRŒSUS, and LYDIA. After the conquest of Sardis, Cyrus turned his arms against Babylon, which he reduced, as related under BABYLONIA. Having settled the civil government of the conquered kingdoms, and restored the Jews to their own land, Cyrus took a review of all his forces, which he found to consist of 600,000 foot, 120,000 horse, and 2000 chariots armed with scythes. With these he extended his dominion all over the nations to the confines of Ethiopia, and to the Red Sea; after which he continued to reign peaceably over his vast empire till his death, which happened about A. A. C. 529. In the time of Cyrus the Persian empire extended from the Indus to the Ægean Sea. On the north it was bounded by the Euxine and Caspian Seas, and on the south by Ethiopia and Arabia. That monarch kept his residence for the seven cold months at Babylon, by reason of the warmth of that climate; three months in the spring he spent at Susa, and two at Ecbatana during the heat of summer.

On his death-bed Cyrus appointed his son Cambyses to succeed him in the empire; and to his other son Smerdis he gave several considerable governments. The new monarch immediately set about the conquest of EGYPT, which he accomplished in the manner related in the history of that country. Having reduced Egypt, Cambyses next resolved to turn his arms against the Carthaginians, Hammonians, and Ethiopians. But he was obliged to drop the first of these enterprises for want of ships: and in attempting to cross the Desert against the latter he lost the greater part of an immense army, and was obliged to return to Thebes. Through jealousy of his brother Smerdis he had caused him to be murdered, but, during his absence on this expedition, a magian, who greatly resembled Smerdis in looks, assumed the name of the deceased prince, and raised a rebellion against Cambyses, who was generally hated for his cruelty. Hastening home to suppress this revolt, his sword accidentally wounded him in the thigh, which occasioned his death.

Though he had on his death-bed informed the nobles of the murder of his brother, and that the person who had usurped the government was an impostor, yet they gave no credit to his assurances: Smerdis the magian was allowed to take possession of the throne in peace, and commenced his reign very popularly. The imposition was, however, soon detected, the false Smerdis having formerly lost his ears; the person who had killed the true Smerdis publicly confessed his crime; a confederacy of seven principal lords was formed against the usurper, and he and his brother Patizithes were slain, after a reign of only eight months. Nor were they the only sufferers. The mob fell upon the magi, and made a general massacre of them; the memory of which was kept up long after by an anniversary festival, called Magophonia. Six of the most noble conspirators having determined to choose a king from among themselves, by repairing on horseback to a particular spot, and bestowing the crown on him whose horse first neighed, Darius, the son of Hystaspes, governor of Susa, was put in possession of this dignity by the sagacity of his groom. He was elected king of Persia in the year 522 B. C. Immediately after his accession he promoted the other six conspirators to the first employments in the kingdom, married the two daughters of Cyrus, Atossa and Artystona, Parmys the daughter of the true Smerdis, and Phedyma the daughter of Otanes, who had detected the imposture of the magi. He then divided the whole empire into twenty satrapies or governments, and appointed a governor over each division, ordering them to pay him an annual tribute. Under Darius the building of the temple of Jerusalem, which had been obstructed by Cambyses and Smerdis, went on successfully, and the Jewish state was entirely restored. The most remarkable of Darius's other transactions were his expeditions against Babylon; against Scythia, India, and Greece. The expedition against Babylon took place A. A. C. 517. The inhabitants of that city, having laid up a stock of provisions for several years, and strangled all the old people and children, and those whom they considered unnecessary, shut themselves up, and withstood the siege of Darius and all his forces for a year and eight months, and would most probably have succeeded in tiring them out; but Zopyrus, one of Darius's generals, having cut off his own nose and ears, persuaded them he had been thus barbarously treated by the monarch, and was desirous of revenge; so they intrusted to him the guard of the city, which he delivered up to the Persians. Darius beat down the walls of that metropolis to the height of fifty cubits; 3000 of the most active in the rebellion were impaled; the rest pardoned. After the reduction of Babylon Darius undertook a Scythian expedition, directed against those nations which lie between the Danube and the Tanais. In this, however, he was not so fortunate. He led 700,000 men into Scythia, but the inhabitants, too wise to oppose so vast an army in the field, retreated before him, wasting the country as they fled. Seeing the imminent danger his army were in of perishing for want, he began his retreat, which he effected with the loss of the old and sick, whom he left behind him. India, however, felt and submitted to his prowess. He reduced that large country, and made it a province of the Persian empire, drawing from thence an annual tribute of 360 talents of gold. He also undertook an unfortunate expedition into Greece. The ill success which attended him here, however, was so far from making him drop the enterprise that it only made him the more intent on reducing the Grecians; and he resolved to head his army in person, having attributed his former bad success to the inexperience of his generals. But, while he was making the necessary preparations for this purpose, he received intelligence that the Egyptians had revolted, so that he was obliged to make preparations for reducing them also; and before this could be done the king died, after having reigned thirty-six years, leaving the throne to his son Xerxes.

This prince ascended the throne of Persia in the year 485 B. C.; and his first enterprise was to reduce the Egyptians, which he effectually did, bringing them into a worse state of slavery than they ever had experienced. After this he also resolved on an expedition into Greece; the unfortunate event of which made him at last so dispirited that he henceforth abandoned all thoughts of war and conquests; but growing tyrannical, and oppressing his subjects, he was murdered in his bed, A. A. C. 464, and twenty-first of his reign; and was succeeded by his third son Artaxerxes, surnamed Longimanus on account of the great length of his arms. This prince is named Ahasuerus in Scripture, and is the same who married Esther, and during the whole of his reign showed the greatest kindness to the Jewish nation. In the beginning of his reign he was opposed by Hystaspes the second son of Xerxes, whom, however, he overcame, though not without considerable difficulty. After this he settled the affairs of government, and reformed many abuses which had crept in; and then, being fully established on the throne, he appointed feasts and rejoicings to be made for 180 days in the city of Susa; at one of which he resolved to divorce his queen for disobedience; and afterwards married the Jewess Esther, as recorded Est. ii. 1—18. In the fifth year of his reign the Egyptians revolted anew, and, being assisted by the Athenians, held out for six years; but were again obliged to submit, and continued in subjection during the whole of his reign. Nothing else remarkable happened during the life of Artaxerxes Longimanus, who died in the forty-first year of his reign; and was succeeded by Xerxes II., the only son he had by his queen, though by his concubines he had seventeen.

Xerxes II., having drunk immoderately at an entertainment immediately after his accession, retired to a chamber to refresh himself with sleep; but here he was murdered by Sogdianus, the son of Artaxerxes by one of his concubines, after he had reigned forty-five days. Sogdianus was scarcely seated on the throne when he put to death Bagorazus, the most faithful of all his father's eunuchs; by which, and the murder of his sovereign, he became generally odious. He next sent for his brother Ochus, intending to murder him; but the latter, having collected a great army under pretence of avenging the death of Xerxes, and being joined by many of the nobles and governors of provinces, Sogdianus proposed an accommodation. Ochus, however, no sooner had him in his power than he caused him to be suffocated among ashes. Being settled on the throne, Ochus changed his name to Darius; and is by historians commonly called Darius Nothus, or The Bastard. But Arsites, another of the brothers, seeing how Sogdianus had got the better of Xerxes, and Ochus of him, revolted. He was not, however, successful; for being defeated in an engagement he surrendered, and was immediately put to death by suffocation. Several other persons were executed: but these severities did not procure Ochus repose; for his whole reign was disturbed with violent commotions. One of the most dangerous was raised by Pisuthnes governor of Lydia; but he, being deserted by his Greek mercenaries, was overcome, and put to death. His son Amorgas continued to infest the maritime provinces of Asia Minor for two years; till he also was taken and put to death by Tissaphernes, governor of Lydia. Other insurrections quickly followed; particularly that of the Egyptians, who could not be reduced. Before his death Darius invested Cyrus his youngest son with the supreme government of all Asia Minor. This was done through the persuasion of his mother Parysatis, who had an absolute sway over her husband; and she procured this command for him, that he might thereby be enabled to contend for the kingdom after his father's death. He died A. A. C. 405, and was succeeded by his son Artaxerxes, by the Greeks surnamed Mnemon, on account of his extraordinary memory.

The most remarkable transaction during the reign of this prince was the revolt of his brother Cyrus. He began with gaining over the cities under Tissaphernes; which quickly produced a war with that governor. Cyrus then began to assemble troops, which he pretended were designed only against Tissaphernes. As he had given great assistance to the Spartans in their wars against the Athenians, he now demanded assistance from them; which they very readily granted. Cyrus, having thus collected an army of 13,000 Greek mercenaries and 100,000 regular troops of other nations, set out from Sardis, towards Upper Asia. Having arrived at Cunaxa, in Babylon, Cyrus found his brother with 900,000 men ready to engage him. Clearchus, the commander of the Peloponnesian troops, advised Cyrus not to charge in person, but to remain in the rear of the Greek battalions; but he replied that he should thus render himself unworthy of the crown for which he was fighting. As the king's army drew near, the Greeks fell upon them with such fury that they routed the wing opposite to them almost at the first onset; upon which Cyrus was with loud shouts proclaimed king by those next to him. But he, perceiving that Artaxerxes was wheeling about to attack him in flank, advanced against him with 600 chosen horse, killed Artageses, captain of the king's guards, with his own hand, and put the whole body to flight. In this encounter, discovering his brother, he spurred on his horse, and, coming up to him, engaged him with great fury. Cyrus killed his brother's horse, and wounded him on the ground; but he immediately mounted another, when Cyrus attacked him again, and gave him a second wound; until the guards, perceiving the king's danger, discharged their arrows against Cyrus, who at the same time was pierced through by his brother's javelin. He fell dead upon the spot; and all the chief lords of his court were slain with him. In the mean time, the Greeks having defeated the enemy's left wing, commanded by Tissaphernes, and the king's right wing having put to flight Cyrus's left, both parties imagined that they had gained the victory. But Tissaphernes acquainting the king that his men had been put to flight by the Greeks, he immediately rallied his troops. The Greeks under Clearchus easily repulsed them, and pursued them to the foot of the neighbouring hills. As night was drawing near, they returned to their camp, but found that the greatest part of their baggage had been plundered, and all their provisions taken. The next morning t ey received the news of Cyrus's death, and the defeat of the army under him. Whereupon they sent deputies to Ariæus, commander in chief of all the other forces of Cyrus, offering him the crown of Persia. Ariæus rejected the offer, and, acquainting them that he intended to set out on his return to Ionia, advised them to join him in the night. They followed his directions, and, under Clearchus, arrived at his camp about midnight, whence they set out on their return to Greece. They were at a vast distance from their own country, in the very heart of the Persian empire, surrounded by a victorious and numerous army, and had no way to return again, but by forcing their way through an immense track of the enemy's country. But their valor and resolution mastered all these difficulties; and in spite of a powerful army, which pursued and harassed them all the way, they made good their retreat for 2325 miles through the provinces belonging to the enemy, and got safe to the Greek cities on the Euxine Sea. This retreat, the longest that ever was made through an enemy's country, was conducted at first by Clearchus; but he being cut off, through the treachery of Tissaphernes, Xenophon was chosen in his room. See XENOPHON. The war with Cyrus was scarcely ended, when another broke out with the Spartans, on the following account:—Tissaphernes being appointed to succeed Cyrus in all his power, to which was added all which he himself possessed formerly, began to oppress the Greek cities in Asia in a most cruel manner. On this they sent ambassadors to Sparta, desiring assistance. The Spartans, having ended their long war with the Athenians, willingly laid hold of this opportunity of breaking with the Persians, and therefore sent against them an army under the command of Thimbro, who, being strengthened by the forces which returned under Xenophon, took the field against Tissaphernes. But, Thimbro being recalled, Dercyllidas, a brave officer, was appointed to succeed him; and he carried on the war to much more advantage. Finding that Tissaphernes was at variance with another governor named Pharnabazus, he concluded a truce with the former, and, marching against Pharnabazus, drove him quite out of Æolis, and took several cities in other parts. The latter repaired to the Persian court, complained against Tissaphernes, and advised the king to equip a powerful fleet, and give the command of it to Conon the Athenian, by which he would obstruct the passage of further recruits from Greece; and thus soon put an end to the power of the Spartans in Asia. The king accordingly ordered 500 talents for the equipment of a fleet, and appointed Conon commander of it. The Spartans, hearing of this, sent over Agesilaus, one of their kings, and a most experienced commander, into Asia. This was done with such secrecy that Agesilaus arrived at Ephesus before the Persians had the least notice of his designs. He took the field with 10,000 foot and 4000 horse, and, falling upon the enemy while totally unprepared, carried every thing before him. Tissaphernes deceived him into a truce till he got his troops assembled, but gained little by his treachery; for Agesilaus deceived him in his turn, and, while Tissaphernes marched his troops into Caria, the Greeks invaded and plundered Phrygia. After various deceptive manœuvres on each side, Agesilaus led his troops against Sardis; and Tissaphernes having despatched a body of horse to its relief, Agesilaus fell upon them before the foot could come to their assistance. The Persians were routed at the first onset; after which Agesilaus over-ran the whole country, enriching his army with the spoils. By this continued ill fortune Artaxerxes was so much provoked against Tissaphernes that he caused him to be put to death. Tithraustus, who was appointed to succeed him, sent large presents to Agesilaus, to bribe him to abandon his conquests; but, finding him determined not to relinquish the war, he sent Timocrates of Rhodes into Greece, with money to bribe the leading men in the cities, and rekindle a war against the Spartans. Accordingly the cities of Thebes, Argos, Corinth, &c., entering into a confederacy, obliged them to recall Agesilaus to defend Sparta. After his departure, which happened A. A. C. 354, the Spartan power received a severe blow at Cnidos, where their fleet was entirely defeated by that of Artaxerxes under Conon, fifty of their ships being taken in the engagement; after which Conon and Pharnabazus, being masters of the sea, sailed round the islands and coasts of Asia, taking the cities there which had been reduced by the Spartans. Sestos and Abydos only held out, and resisted the utmost efforts of the enemy, though they had been besieged both by sea and land. Next year Conon, having assembled a powerful fleet, again took Pharnabazus on board, and reduced the island of Melos, whence he made a descent on the coasts of Lycaonia, pillaging all the maritime provinces, and loading his fleet with an immense booty. After this Conon obtained leave to return to Athens, with eighty ships and fifty talents, to rebuild the walls of that city. Having a great number of hands, the work was soon completed, and the city not only restored to its former splendor, but rendered more formidable than ever. The Spartans were soon reduced to the necessity of making peace. The terms were, that all the Greek cities in Asia should be subject to the king of Persia, also the islands of Cyprus and Clazomena; that Scyros, Lemnos, and Imbros, should be restored to the Athenians, and all the cities of Greece declared free.

Artaxerxes engaged to join those who accepted these terms, and to assist them against such as should reject them. Being now disengaged from the Grecian war, he turned his arms against Evagoras, king of Cyprus, who was descended from the ancient kings of Salamine, the capital of Cyprus. His ancestors had reigned there for many ages, but were at last driven out by the Persians, who reduced the island to a Persian province. Evagoras, however, being a man of an enterprising genius, drove out the Persian governor. Artaxerxes therefore attempted to expel him; but Conon, by means of Ctesias, chief physician to Artaxerxes, got all differences accommodated. Evagoras then gradually reduced under his subjection almost the whole of the island. Some towns, however, held out, and applied to Artaxerxes for assistance; who, as soon as the war was at an end, bent all his force against Evagoras. The Athenians, notwithstanding the favors conferred upon them by Artaxerxes, could not forbear assisting their old ally in his emergency, and sent ten men of war under Philocrates; but the fleet commanded by Talentias, brother to Agesilaus, falling in with them near Rhodes, surrounded them so that not one ship escaped. The Athenians sent Chabrias with another fleet and body of land forces, with which he quickly reduced the whole island. But the Athenians being soon after obliged, by a treaty concluded with the Persians, to recall Chabrias, Artaxerxes attacked the island with 300,000 men and 300 ships. Evagoras applied to the Egyptians, Lybians, Arabians, Tyrians, and other nations, from whom he received supplies both of men and money; and fitted out a fleet, with which he ventured an engagement with that of Artaxerxes. But being defeated, and obliged to shut himself up in Salamine, he was closely besieged, and at last was obliged to capitulate, and give up the whole island except Salamine, which he held as a king tributary to Artaxerxes. The Cyprian war being ended, Artaxerxes turned his arms against the Cadusians, whose country lay between the Euxine and Caspian Seas, but was obliged to abandon the project, after having lost a great number of troops and all his horses. In his Egyptian expedition, which happened immediately after the Cadusian war, he was attended with little better success, owing to the bad conduct of Pharnabazus. This commander sent an ambassador to Athens, demanding Iphicrates, the best general of his time, to command the Greek mercenaries in the Persian service. This the Athenians complied with; and Iphicrates having mustered his troops, so exercised them in all the arts of war, that they became famous among the Greeks under the name of Iphicratesian soldiers. But the Persians were so slow in their preparations that two whole years elapsed before they were ready to take the field. Artaxerxes, that he might draw the more mercenaries out of Greece, sent ambassadors to the different states in it, enjoining them to live at peace with each other, on the terms of the treaty lately concluded. The troops were mustered at the city then called Ace, and since called Ptolemais; where they amounted to 200,000 Persians under Pharnabazus, and 20,000 Greeks led by Iphicrates. The fleet consisted of 300 galleys, besides a vast number of other vessels which followed with provisions. The fleet and army began to move at the same time; and separated as little as possible. Having made a descent at one of the mouths of the Nile, they took a fortress, and put all the Egyptians in it to the sword. Iphicrates then proposed embarking the troops without loss of time, and attacking Memphis, the capital, which would have rendered it easy to reduce the whole country; but Pharnabazus would undertake nothing before the rest of the forces were come up: neither would he permit Iphicrates to attack the place with the Greek mercenaries only, from a mean jealousy of the honor which he might acquire; and thus the Egyptians recovered courage to put themselves in such a posture of defence that they could not be attacked with any probability of success; and the Nile, overflowing its banks, obliged them to return to Phœnice. The expedition was again undertaken twelve years after, but without success. The last years of Artaxerxes were greatly disturbed by dissensions in his family; and he died in the ninety-fourth year of his age, and forty-sixth of his reign.

He was succeeded by one of his sons named Artaxerxes Ochus, who behaved with such cruelty that almost one half of his dominions revolted as soon as he came to the throne. But, by the dissensions of the rebels among themselves, all of them were reduced one after another; and the Sidonians, finding themselves betrayed, burnt themselves, to the number of 40,000, together with their wives and children. Artaxerxes Ochus, having quelled all the insurgents, immediately set himself about reducing Egypt, and for this purpose procured a reinforcement of other 10,000 mercenaries from Greece. On this march he lost a great number of his men in the lake Serbonis. When the south wind blows this lake is said to have been covered with sand in such a manner that no one could distinguish it from the firm land. Several parties of Ochus's army were lost in it for want of proper guides; and whole armies have sometimes perished in it. When he arrived in Egypt he detached three bodies to invade the country; each commanded by a Persian and a Greek. The first was led by Lachares the Theban, and Rosaces governor of Lydia and Ionia; The second by Nicostratus the Theban and Aristazanes; the third by Mentor the Rhodian and Bagoas an eunuch. The main body of the army he kept with himself, and encamped near Pelusium, to watch the events of the war. The event was successful, and Ochus, having reduced the whole country, dismantled their strong holds, plundered the temples, and returned to Babylon loaded with booty; where he conferred high rewards on those who had distinguished themselves. To Mentor the Rhodian he gave 100 talents, and other presents; appointed him governor of all the coasts of Asia, and committed to his care the whole management of the war which he was still carrying on, and, either by stratagem or by force, he at last reduced all the provinces that had revolted. Ochus then gave his attention to nothing but his pleasures, leaving the administration of affairs entirely to Bagoas the eunuch, and to Mentor. These two agreeing to share the power between them, the former had Upper Asia, and the latter all the rest. Bagoas, being an Egyptian, had a great zeal for the religion of his country, and endeavoured, on the conquest of Egypt, to influence the king in favor of the Egyptian ceremonies; but Ochus not only refused to comply, but killed the sacred bull, the emblem of Apis, plundered the temples, and carried away their sacred records. Bagoas in revenge poisoned his master and benefactor in the twenty-first year of his reign; kept the king's body, causing another to be buried in its stead; and, because the king had caused his attendants to eat the flesh of Apis, Bagoas cut his body in pieces, and gave it so mangled to be devoured by cats, making handles for swords of his bones. He then placed Arses the youngest of the deceased king's sons on the throne, that he might the more easily preserve the whole power to himself.

Arses did not long enjoy even the shadow of power which Bagoas allowed him, being murdered in the second year of his reign by that treacherous eunuch, who now conferred the crown on Darius Codomanus, a relation of the royal family. But, finding that he would not suffer himself to be guided by him in all things, Bagoas brought him also a poisonous potion; when Darius practised upon him his own artifice, causing him to drink the poison which he brought. This established Darius in the throne as far as security from internal enemies could do so; but in a very little time his dominions were invaded, and soon conquered, by Alexander the Great. The particulars of that hero's conquests are related under MACEDON: we shall therefore here only take notice of the fate of Darius himself, with which the Persian empire concluded for many ages. After the battle of Arbela, Alexander took and plundered Persepolis, whence he marched into Media, in pursuit of Darius, who had fled to Ecbatana the capital. This prince had still an army of 30,000 foot, among whom were 4000 Greeks, who continued faithful to the last. Besides these he had 4000 slingers and 3000 horse, most of them Bactrians, commanded by Bessus. When Darius heard that Alexander had marched to Ecbatana, he retired into Bactria, with a design to raise another army; but soon after he determined to venture a battle with the forces he still had left. On this Bessus, governor of Bactria, and Nabarzanes, a Persian lord, formed a conspiracy to seize his person, and, if Alexander pursued them, to gain his friendship by betraying their master into his hands; but if they escaped, their design was to murder him, and usurp the crown. The troops were easily gained over; but Darius himself, when informed of their proceedings, and solicited to trust his person among the Greeks, could not give credit to the report. The consequence was that he was in a few days seized by the traitors; who bound him with golden chains, and, shutting him up in a covered cart, fled with him towards Bactria. The cart was covered with skins, and strangers appointed to drive it without knowing who the prisoner was. Bessus was proclaimed commander and chief by the Bactrian horse; but Artabazus and his sons, with the forces they commanded, and the Greeks, under one patron, retired from the army under Bessus, and marched over the mountains towards Parthiene. Alexander, arriving at Ecbatana, was told that Darius had left the place five days before. He then despatched orders to Clitus, who had fallen sick at Susa, to repair, as soon as he recovered, to Ecbatana, and thence to follow him into Parthia with the cavalry and 6000 Macedonians, who were left in Ecbatana. Alexander himself, with the rest of the army, pursued Darius; and the eleventh day arrived at Rhages, having marched in that time 3300 furlongs. Most of those who accompanied him died through fatigue; insomuch that, on his arrival at Rhages, he could scarcely muster sixty horsemen. Finding that he could not come up with Darius, who had passed the Caspian straits, he staid five days at Rhages, to refresh his army, and settle the affairs of Media. Thence he marched into Parthia, and encamped near the Caspian straits, which he passed next day without opposition. He had scarcely entered Parthia, when he was informed that Bessus and Nabarzanes had conspired against Darius, and designed to seize him. Hereupon, leaving the main body of the army with Craterus, he advanced with a small troop of horse, and, having marched day and night, he came on the third day to a village where Bessus with his Bactrians had encamped the day before. At this place he learnt that Darius had been seized by the traitors; that Bessus had caused him to be shut up in a close cart, and that the whole army, except Artabazus and the Greeks, obeyed Bessus. At last Alexander came in sight of the barbarians, who were marching in great confusion. His unexpected appearance struck them, though far superior in number, with such terror, that they immediately fled; and, because Darius refused to follow them, Bessus, and those who were about him, discharged their darts at the unfortunate prince, leaving him wallowing in his blood. After this they all fled different ways, and were pursued by the Macedonians with great slaughter. In the mean time the horses that drew the cart in which Darius was, stopped; for the drivers had been killed by Bessus, near a village about four furlongs from the highway; and Polystratus, a Macedonian, being pressed with thirst, was directed by the inhabitants to a fountain near the place. As he was filling his helmet with water, he heard the groans of a dying man; and, looking round him, discovered a cart with a team of wounded horses, unable to move. Approaching it, he perceived Darius lying in the cart, having several darts in his body. He had enough of strength however, left to call for some water, which Polystratus brought him; and after drinking, turned to the Macedonian, and with a faint voice told him, that, in the deplorable state to which he was reduced, it was no small comfort to him that his last words would not be lost: he then charged him to return his hearty thanks to Alexander for the kindness he had shown to his wife and family, and to acquaint him, that, with his last breath, he besought the gods to prosper him, and make him sole monarch of the world. He added, that it did not so much concern him as Alexander to pursue and bring to condign punishment those traitors who had treated their lawful sovereign with such cruelty. Then taking Polystratus by the hand, 'Give Alexander your hand,' says he, 'as I give you mine, and carry him, in my name, the only pledge I am able to give, in this condition, of my gratitude and affection.' Having uttered these words, he expired in the arms of Polystratus. Alexander coming up, a few minutes after, bewailed his death, and caused his body to be interred with the highest honors. The traitor Bessus, being at last reduced to extreme difficulties, was delivered up by his own men, naked and bound, into the hands of the Macedonians; on which Alexander gave him to Oxyathres the brother of Darius, to suffer what punishment he should think proper. Plutarch tells us that he was executed in the following manner:—Several trees being by main force bent down to the ground, and one of the traitor's limbs tied to each of them, the trees, as they were suffered to return to their natural position, flew back with such violence that each carried with it a limb. Thus ended the ancient empire of Persia, 209 years after it had been founded by Cyrus.

After the death of Alexander, the Persian dominions became subject to Seleucus Nicator, and his successors, for sixty-two years, when the Parthians revolted, and conquered the greatest part of them. To the Parthians they continued subject for 475 years, when the sovereignty was again restored to the Persians, as related under PARTHIA. The restorer of the Persian monarchy was Artaxerxes, or Artaxares, who was not only a private person, but of spurious birth. However, he possessed great talents, and took the pompous title of king of kings. He gave notice to the Roman governors of the provinces bordering on his dominions, that he had a just right, as the successor of Cyrus, to all the Lesser Asia; which he commanded them immediately to quit, as well as those on the frontiers of the ancient Parthian kingdom. The consequence of this was a war with Alexander Severus, the Roman emperor. Of the event of this war there are very different accounts. It is certain, however, that on account of his exploits against Artaxares, Severus took the titles of Parthicus and Persicus; though, it would seem with no great reason, as the Persian monarch lost none of his dominions, and his successors were equally ready with himself to invade the Roman territory.

Artaxares dying, after a reign of twelve or fifteen years, was succeeded by his son Sapor, a prince also of great abilities, but fierce, haughty, and untractable. He was no sooner seated on the throne than he began a new war with the Romans, in which at the beginning he was unsuccessful, being obliged by Gordian to withdraw from the Roman dominions, and even invaded in his turn; but, in a short time, Gordian being murdered by Philip, the new emperor made peace with him upon terms very advantageous to the Persians. Sapor now renewed his incursions, and made such alarming progress that the emperor Valerian, at the age of seventy, marched against him in person with a numerous army. An engagement ensued, in which the imperial troops were defeated, and Valerian taken prisoner. Sapor pursued his advantages with such cruelty that the people of the provinces took arms, first under Callistus, a Roman general, and then under Odenatus, prince of Palmyrene. The result was that they not only protected themselves from the insults of the Persians, but even gained many victories over them, and drove Sapor with disgrace into his own territory. In his march he is said to have made use of the bodies of his unfortunate prisoners to fill up the hollow roads, and to facilitate the passage of his carriages over several rivers. On his return to Persia, he was solicited, but in vain, by several neighbouring princes, to set Valerian at liberty. On the contrary he treated him daily with studied indignities; set his foot upon his neck when he mounted his horse, and finally, after some years confinement, flayed him alive; and caused his skin to be tanned, and preserved as a trophy of his victory over the Romans. This extreme insolence and cruelty was followed by an uninterrupted course of misfortune. Odenatus defeated him in every engagement, and even seemed ready to overthrow his empire: after him Aurelian took ample vengeance for the captivity of Valerian. Sapor died A. D. 273, after having reigned thirty-one years: and was succeeded by his son Hormisdas, and he by Varanes I. The former reigned a year and ten days, and the latter three years; after which he left the crown to Varanes II., who seems to have been so much awed by the Roman power that he durst undertake nothing. The rest of the Persian history, to the overthrow of the empire by the Saracens, affords nothing but an account of their continued invasions of the empire, which more properly belongs to the history of ROME and CONSTANTINOPLE.

and to which we therefore refer. The last of the Persian monarchs, of the line of Artaxares, was Isdigertes, or Iezdegerd, who was contemporary with Omar, the second caliph after Mahomet. He was scarcely seated on the throne when he found himself attacked by a powerful army of Saracens under the command of one Sad, who invaded the country through Chaldea. The Persian general made every effort to harass the Arabs on their march; and, having an army superior to them in numbers, employed them continually in skirmishes: but Sad, perceiving that this lingering war would destroy his army, determined to force the enemy to a general engagement; which he at last accomplished with complete success, after a battle that lasted three days and three nights. Thus the capital, and the greatest part of the dominions of Persia, fell into the hands of the Arabs; along with the king's treasures, which were immense; A. D. 643.

After this battle Jezdegerd retired into Chorassan, where he reigned as king, over it and the two provinces of Kerman and Segestan. But, after about nineteen years, the governor of Merou betrayed it to the Turks. Jezdegerd immediately marched against the rebels and their allies, but was defeated; and, having with much difficulty reached the river, while he was bargaining with the ferryman about his fare, a party of the rebel horse came up, and killed him. This was in 652. Jezdegerd left behind him a son named Firouz, and a daughter, Dara. The latter espoused Bostenay, whom the rabbinical writers entitle the head of the captivity; and who, in fact, was the prince of the Jews settled in Chaldea. As for Firouz, he still preserved a little principality; and, when he died, left a daughter named Mah Afrid, who married Walid, the son of the caliph Abdalmalek, by whom she had a son named Yezid, who became caliph, and sovereign of Persia; and who, claiming the title derived from his mother, constantly styled himself the son of Khosrou, king of Persia, the descendant of caliph Maroan, and among whose ancestors on the side of the mother were the Roman emperor and the khacan. Persia continued to be subject to the Arabs till the decline of the Saracen empire; being governed by deputies, entitled sultans, under the grand khalifs. But in process of time the sultans of Persia, Babylon, &c., quarrelled among themselves, and occasioned several revolutions, and fluctuations of power, the consequence of which was the coming in of the Turks. Tangrolopix, their leader, conquered the sultan of Persia in 1030, and assumed the government. He was succeeded by a race of Turkish princes for about 100 years, when the Tartars invaded Persia, drove out the Turks, and a new dynasty of Tartarian princes succeeded: after which it was seized by various usurpers, till the time of Jenghiz Khan, who conquered it, with almost all the rest of Asia.

After the death of Jenghiz Khan, which happened in 1227, Persia and the neighbouring countries were governed by officers appointed by his successors, who reigned at Kerakorom, in the eastern parts of Tartary, till 1253, when it became once more the seat of a considerable empire under Haalen, or Hulaku the Mogul, who, in 1256, abolished the khalifat, by taking Bagdad. After the death of Hulaku his son Abaka succeeded to his extensive dominions; who, in the very beginning of his reign, was invaded by Barkan Khan, of the race of Jagatay, the son of Jenghiz Khan, from Great Bukharia, with an army of 300,000 men; but, happily for Abaka, Barkan died before the armies came to an engagement, upon which the invaders returned to Tartary. In 1264 Armenia and Anatolia were ravaged by the Mamelukes from Egypt, but they were obliged to fly from Abaka; who thus seemed to be established in an empire almost as extensive as that of the ancient Persian kings. But in 1268 his dominions were invaded by Borak Khan, another descendant of Jagatay, with an army of 100,000 men. He quickly reduced the province of Chorassan, and in 1269 advanced as far as Aderbijan, where Abaka had the bulk of his forces. A bloody battle ensued, in which Abaka was victorious, and Borak obliged to fly into Tartary, with the loss of all his baggage, and great part of his army. Abaka died in 1282, after a glorious reign of seventeen years, and was succeeded by his brother Achmed Khan. He was the first of the family of Jenghiz Khan who embraced Mahometanism; but neither he nor his successors appear to have been much versed in the arts of government; for the Persian history, from this period, becomes only an account of insurrections, murders, and rebellions, till the year 1337; when, upon the death of Abusaid, it split to pieces, and was possessed by a great number of petty princes; all of whom were at perpetual war with each other till the time of Timur Beg, or Tamerlane, who once more, about A. D. 1400, reduced them under one jurisdiction.

After the death of Tamerlane Persia continued to be governed by his son Shah Rukh, or Mirza, a wise and valiant prince: but it did not remain in the family above six short reigns: after continual dissensions among themselves, the last of them was defeated and slain in 1472, by Usum Cassan, an Armenian prince. There were five princes of this line; after which the empire was held by a great number of petty tyrants, till the beginning of the sixteenth century, when it was conquered by Shah Ismael Safi, Sofi, or Sophi; whose father was Sheykh Hayder, the nineteenth in a direct line from Ali the son-in-law of Mahomet. When Tamerlane returned from the defeat of Bajazet, the Turkish sultan, he carried with him a great number of captives out of Karamania and Anatolia, intending to put them to death; and with this intent he entered Ardebil, a city of Arderbijan, twenty-five miles east of Taurus, where he continued for some days. At this time lived in that city the Sheykh Sesi, reputed by the inhabitants to be a saint; and as such was much reverenced by them. From the fame of his sanctity, Tamerlane paid him frequent visits; and, when he was about to depart, promised to grant whatever favor he should ask; Sesi requested that he would spare the lives of his captives. Tamerlane granted this request; upon which the Sheykh furnished them with clothes and other necessaries, and sent them home. The people were so much affected with this extraordinary instance of virtue that they afterwards repaired in great numbers to Sesi, bringing with them considerable presents. Thus the descendants of the Sheykh made a conspicuous figure till 1486, when they were all destroyed by the Turks except Ismael, who fled to Ghilan; where he lived for some time under the protection of the king of that country. There was at that time a vast number of different sects of Mahometans dispersed over Asia; and, among these, a party who followed Hayder, the father of Ismael. Ismael, therefore, finding that Persia was in confusion, and hearing that there was a great number of the Hayderian sect in Karamania, removed thither, and collected 7000 of his party, by whose aid he conquered Shirwan. After this he pursued his conquests; and, as his antagonists never united to oppose him, had conquered the greatest part of Persia, and reduced the city of Bagdad in 1510. But in 1511 he received a great defeat from Selim I., who took Tauris, and would probably have crushed the new Persian empire in its infancy, had he not thought the conquest of Egypt more important.

MODERN PERSIA.—Ismael died in 1523, leaving the crown to his eldest son Thamasp I., a man of very limited abilities, and who was invaded by the Turks on his accession to the throne. However, they were obliged to retreat by an inundation, which overflowed their camp. Thamasp then reduced Georgia to a province of the empire, which had previously been divided among a number of petty princes. The reigns of the succeeding princes afford nothing remarkable till the time of Shah Abbas I., surnamed the Great. He ascended the throne in 1584; and began with declaring war against the Tartars, who had seized the finest part of Chorassan. Having raised a powerful army, he entered that province, where he was met by Abdallah Khan, the chief of the Usbeck Tartars, whom he attacked and defeated. Here he continued three years; and, on leaving Chorassan, fixed the seat of government at Ispahan, where it has continued ever since. His next expedition was against the Turks, from whom he took the city of Tauris, after defeating the garrison; on which most of the other adjacent places submitted. One city only, called Orumi, being strongly situated, resisted all the efforts of Abbas; but was at last taken by the assistance of the Curds, whom he gained over by promising to share the plunder with them. Instead of this, however, he invited their chiefs to dine with him; and, having brought them to a tent, the entrance to which had several turnings, he stationed on the inside two executioners, who cut off the heads of the guests as soon as they entered. After this barbarous piece of treachery, Abbas considerably enlarged his dominions, and repelled two dangerous invasions of the Turks. He attempted also to promote commerce, and civilise his subjects; but stained all his great actions by abominable cruelties. He took the isle of Ormus from the Portuguese, who had kept it since 1507, by the assistance of some English ships in 1622; and died six years after, aged seventy.

The princes who succeeded Abbas were remarkable only for those cruelties and debaucheries which occasioned a revolution in 1716, when Shah Hussein was dethroned by the Afghauns or Pattans; who, being oppressed by the ministers, revolted, under the conduct of one Mereweis. The princes of the Afghaun race enjoyed the sovereignty only sixteen years, when Ashraff, the reigning shah, was dethroned by one of his officers. On this Thamasp, otherwise called Thamas, the only survivor of the family of Abbas, assembling an army, invited into his service Nadir Khan, who had obtained great reputation for his valor and conduct. No sooner had Nadir got the command of the Persian army than he attacked and defeated the usurper Esriff, put him to death, and recovered all the places the Turks and Russians had taken during the rebellion, when prince Thamas seemed to be established on the throne: but Nadir, to whom Thamas had given the name of Thamas Kouli, that is, the Slave of Thamas, thinking his services not sufficiently rewarded, and pretending that the king had a design against his life, conspired against his sovereign, put him to death, and usurped the throne, styling himself Shah Nadir. He afterwards laid siege to Candahar, of which a son of Mereweis had possessed himself. While at this siege, the court of the Great Mogul being distracted with factions, one of the parties invited Shah Nadir to come to their assistance, and betrayed the Mogul into his hands. He thereupon marched to Delhi, the capital of India, summoning all the viceroys and governors of provinces to attend him, and bring with them all the treasures they could raise: those that did not bring as much as he expected he tortured and put to death. Having thus amassed an immense treasure, he returned to Persia, giving the Mogul his liberty on condition of his resigning the provinces on the west side of the Indus to Persia. He afterwards made a conquest of Usbeck Tartary, and plundered Bochara the capital. Then he marched against the Dagistan Tartars; but lost great part of his army in their mountains. He defeated the Turks in several engagements; but, laying siege to Bagdad, was twice compelled to raise it. He proceeded to change the religion of Persia to that of Omar, hanged up the chief priests, put his own son to death, and was guilty of such cruelty that he was at length assassinated by his own relations in 1747.

Upon the death of Shah Nadir a contest ensued among his relations for the crown, which rendered Persia a scene of the most horrible confusion for upwards of forty years. The reader will form some notion of the troubles of this unhappy country from the following series of pretenders to the throne, between the death of Nadir and the accession of Kerim Khan:—Their reigns, or more properly the length of time they respectively governed with their party, were as follows;—1. Adil Shah, nine months. 2. Ibrahim Shah, six months. 3. Shah Rokh Shah, after a variety of revolutions, at length regained the city of Meschid; he was alive in 1787, and above eighty years of age, reigning in Khorasan, under the direction of his son Nussir Ullah Meerza. 4. Suleeman Shah, and 5 Ismael Shah, in about forty days were both cut off, almost as soon as they were elevated. 6. Azad Khan

Afghan, one of Kerim Khan's most formidable rivals and competitors, was subdued by him, brought prisoner to Shirauz, and died there a natural death. 7. Hussun Khan Kejar, another of Kerim Khan's competitors, was besieging Shirauz, when his army suddenly mutinied and deserted him. The mutiny was attributed to their want of pay. A party sent by Kerim Khan took him prisoner; his head was instantly cut off, and presented to Kerim Khan. His family were brought captives to Shirauz; they were well treated, and had their liberty given them soon after, under an obligation not to quit the city. 8. Ali Merdan Khan was killed by a musket-shot, as he was walking on the ramparts of Maschid encouraging his men. 9. Kerim Khan Zund, by birth a Curdistan, was a favorite officer of Nadir Shah, and at the time of his death was in the southern provinces. Shirauz and other places had declared for him. After various encounters, he completely subdued all his rivals, and finally established himself ruler of all Persia. He was in power about thirty years; the latter part of which he governed Persia under the appellation of vakeel or regent, for he never would take the title of shah. He made Shirauz the chief city of his residence, in gratitude for the assistance he had received from its inhabitants and those of the southern provinces. He died in 1779, regretted by all his subjects, who esteemed and honored him as the glory of Persia.

When the death of Kerim Khan was announced in that city much confusion arose; twenty-two principal officers of the army, men of high rank, took possession of the citadel, with a resolution to acknowledge Abul Futtah Khan (the eldest son of the late vakeel) as their sovereign, upon which Zikea Khan, a relation of the late vakeel by the mother's side, possessed of immense wealth, enlisted a great part of the army into his pay. Zikea Khan was of the tribe of Zund (or the Lackeries), a man remarkably proud, cruel, and unrelenting. Having assembled a large body of troops, he marched to the citadel, and laid close siege to it for three days; at the expiration of which, finding he could not take it by force, he had recourse to treachery. To each of the principal khans he sent a written paper, by which he swore upon the Koran, that if they would come out and submit to him, not a hair of their heads should be touched, and, they should have their effects secured to them. Upon this a consultation was held by them; and as they could not subsist many days longer, they agreed to surrender, relying on Zikea's promises. Zikea, in the mean time, gave private orders for the khans to be seized, and brought separately before him as they came out of the citadel. His orders were strictly obeyed, and these deluded men were all massacred in his presence. Zikea Khan's tyranny became soon intolerable, and he was cut off by his own body-guard, when Abul Futtah Khan, who was then in the camp, was proclaimed king by the unanimous voice of the troops, whom he immediately led back to Shirauz. On his arrival he was acknowledged as sovereign by all ranks of people, and took quiet possession of the government.

Mahomed Sadick Khan, only brother of the late Kerim Khan, who had during that prince's life filled the high office of beglerbeg of Fars, and had been appointed guardian of his son Abul Futtah Khan, was at this period governor of Bussora, which had been taken by the Persians, previous to the vakeel's death. Upon hearing of his brother's decease he began to form schemes for the destruction of his nephew; but, as it was necessary for him to be on the spot, he withdrew the Persian garrison from Bussora, who were all devoted to his interest; evacuated the place, and marched immediately for Shirauz. The news of Sadick Khan's approach threw the inhabitants of this city into the greatest consternation; some, from his public character, expected he would fulfil the commands of his deceased brother; others expected he would set up for himself, which proved to be the case; for, having entered Shirauz a very few days after, he caused Abul Futtah Khan to be deprived of sight, and put into close confinement. After this Sadick Khan openly assumed the government. As soon as the intelligence reached Ali Murad Khan, who was at Ispahan, he instantly rebelled; deeming himself to have an equal right to the government with Sadick Khan. Persia was thus again involved in all the horrors of a civil war. Ali Murad Khan indeed took possession of Shirauz, assumed the government, and gave to the empire the flattering prospect of being settled under the government of one man; but this prospect was soon obscured by the power and credit acquired by Akau Mahomed. On the night following Kerim Khan's death this man found means to make his escape from Shirauz, and fled to the northward, where, collecting some troops, he soon made himself master of Mazanderan and Ghilan, and was proclaimed nearly about the time that Ali Murad Khan had taken Shirauz. Ali Murad, hearing of his success, determined to go against him; but, as he was previously proceeding to Ispahan to suppress a rebellion, he fell suddenly from his horse and expired. At this period Jaafar Khan, the eldest and only surviving son of Sadick, was governor of Khums: he deemed this a favorable opportunity to assert his pretensions to the government, and immediately marched with what few troops he had to Ispahan; where, soon after his arrival, he was joined by the greater part of the malcontents who were then in arms. In this situation he remained some time; but, Akau Mahomed coming down upon him with his army, he was obliged to risk his fate in a battle, and, being defeated, fled to Shirauz. Soon after he ventured a second engagement with his opponent; and for this purpose marched with his army towards Ispahan; the two armies met near Yezdekhast, when a battle ensued; and, Akau Mahomed's superior fortune again prevailing, Jaafer was defeated, and retired to Shirauz, which he quitted on the 25th of June, 1787, and shortly after marched his army to th northward.

Akau, or Aga Mahomet's fortunes finally prevailed; and he transmitted the throne of Persia to his nephew, the present shah, Futtah Ali, who is described as an accomplished prince; his eldest son is also said to be an able chieftain, and has distinguished himself in the late contests with Russia.

Modern Statistics of Persia.—On the empire once of this name the great modern encroachments have been those of the Afghauns on the east (see Afghaunistaun), the Turks on the west, or in the direction of the rivers Euphrates and Tigris, and the Russians in Georgia. Various tribes have also rendered themselves independent in the great Caucasian chain. Mr. Kenneir, one of the ablest modern writers on the geography of Persia, includes the following provinces as forming its present dominion:—

Provinces.	Ancient Names.	Chief Towns.
Fars, or Fasistan	Persis, or Persia Proper	Shiraz.
Irak, or Irakadjemi	Media	Ispahan
Lar, or Laristan		Lar.
Kuzistan	Susiana	Shuster.
Kurdistan (part of)	Assyria Proper	
Azerbijan		Tabreez.
Ghilan	Gela	Resht.
Mazanderan	Hyrcania (part of)	Sari.
Khorassan	Margiana and Aria	Meshed.
Kerman (western part)	Caramania	Kerman.

One of the most prominent geographical features of this empire is the grand Caucasian chain, which some writers consider as the root of all its ranges of mountains. It belongs, however, itself rather to the frontier than the interior, especially of late years, and since the success of the Russian arms in this quarter. Southwards from this chain spread the mountains of Armenia and Koordistan, which connect themselves with Mount Taurus; also frontier and debateable ground, i. e. between the Persian and Turkish empires. From the highest part of them, a great chain, under the name of Elwand or Elbruz, makes a circuit round the southern shore of the Caspian, leaving between itself and that sea a fertile plain. Mount Demavend, its loftiest peak, here rises to upwards of 10,000 feet; and near it is supposed to be that remarkable pass to which the ancients gave the name of the Caspian Gates, which for twenty-eight miles allowed only a narrow road between high rocks for a single chariot. The Elbruz is continued along the southern frontier of Khorassan, and, though there lost sight of, is thought to unite with the mountains of Parapomisus, and through them with the Hindoo Cooash and Himmaleh. Chains of inferior height traverse the provinces of Khusistan and Faristan, on the south.

Nearly the whole empire may be said to be traversed by a table land, composed of successive ranges of mountains, with narrow plains at their bases, some of which exceed 100 miles in length. The distinguishing feature perhaps is the great deserts which occupy all the widespread tracts. The most noted is that called the Great Salt Desert, extending from the vicinity of Koom and Kashan, to the sea of Durra, termed also the Lake of Zerrah; and from the province of Kerman to that of Mazanderan. Its length is therefore about 400 miles, and its breadth more than 200. This may be said to join the deserts of Kerman and Seistan, which stretch further to the east, and, like those of Arabia, are all impregnated with nitre. The precise nature of these wastes is scarcely known, but they are interspersed with salt lakes; and in many parts the surface is covered with a crust of brittle earth, or a succession of hills, consisting of particles of the finest red sand, so light as to be almost impalpable, which the violent winds of the desert often raise into a moving cloud, destructive to all life. Smaller deserts occupy other parts.

Modern Persia is singularly poor in rivers, for the Indus, Oxus, Euphrates, and Tigris, as well as the Heirmund, which feeds the lake of Zerrah, are now all beyond her frontier. None that remain are navigable for above three or four miles. We may mention the Karoon, the Kerah, and the Arras or Araxes, as the principal. Various smaller streams descend from the mountains, but are generally soon lost in the dry sandy plains: some few reach the southern shores of the Caspian. On the banks of these streams, however, are some of the most beautiful and fertile plains of the world.

Persia contains several extensive salt lakes. The largest is that of Urumea, near the city of that name, between the Caspian and the western frontier. Its circumference is computed at 300 miles. The shape of this lake is oval, and the waters very salt and clear, emitting a disagreeable sulphureous smell. Mr. Kinneir did not, however, find them encrusted with salt, as some writers have asserted. It contains numerous islands, one of which forms a peninsula when the water is low, and is about twenty-five miles in circuit, inhabited by wild asses, and deer, and other game. Another of these salt lakes is Baktegan, ten miles south-east of Shiraz, and noted for the purity of its salt. Its shape is long and narrow, and its circuit about seventy-five miles. It is nearly dry in summer, when the people who live on its borders collect the salt from the bottom. It is the final receptacle of the river that passes Ispahan. The great lake of Zerrah is at present chiefly included in the dominions of Cabul, and only touches the eastern confines of Persia. The Persian Gulf will be found noticed by us distinctly.

The climate partakes of a variety similar, though arising from very different causes, to that of our own country, and the order of the seasons is very similar to ours. From the end of May to that of September, the heat in the low grounds and sandy deserts of the interior is frequently extreme; but on the sides of the mountains and elevated plains, though the higher peaks are still covered with snow, the summer is mild and agreeable. At Teheran, the present metropolis, the heat of summer is so intense that the king generally quits the capital, and encamps on the adjacent plains; but the winters, to the north of Shiraz, and in higher latitudes, are often severe. Such is their severity at Teheran and Tabreez, that all communication between these towns and the neighbouring villages is frequently suspended for several weeks. The winds that blow over the hot deserts often raise the temperature of the adjacent districts. At Kashan, the heat has been found to exceed that at the village of Kohrood, about twenty-five miles distant, by 20° of Fahrenheit; a difference which can only be accounted for by the proximity to the former place of the Great Salt Desert. From a meteorological journal, kept by Dr. Jukes at Bushire, a port in the upper part of the Persian Gulf, in 1807, it appears that in June, July, August, and September, Fahrenheit's thermometer often rose to 96°, and was never lower than 80°. Throughout the whole of October it did not sink below 72°, but sometimes rose above 90°. On the 29th of December, 1808, the thermometer fell to 30°, but during nearly the whole of the month it had ranged from 40° to upwards of 72°. The place where the observations were made was on a peninsula, exposed to the cooling breezes of the sea. In most places the difference between the temperature of the day and night is great; and a cool wind often springs up in the evening which lasts nearly the whole night, and diffuses such a freshness that warm clothing is sometimes necessary. Sir John Malcolm says, 'In the year 1810, when encamped on the plain of Kubatoo, in Kurdistan, the water in my tent froze to nearly half an inch thick on the 17th of August. The lat. was 36° N., and Fahrenheit's thermometer, at six A. M., stood at 34°.' The transition from heat to cold is sometimes very sudden. Rain seldom falls except in the provinces of Ghilan and Mazanderan. On the whole the air is dry, the atmosphere almost always clear, and the country, perhaps, the most healthy in the east. As so little rain falls, the dews are less copious than in Hindostan.

The soil partakes the diversity of the climate: the centre and south are arid in a high degree, and entirely destitute of trees; while, on the shore of the Caspian, timber is abundant. The well watered plains of Ghilan and Mazanderan yield the sugar-cane in considerable plenty; but even the grains of the temperate climates can only be raised southward by artificial watering, a process to which the indolence of the Persian farmer does not allow him to apply. A vast extent of the empire is therefore abandoned to pasture, and tenanted by nomade tribes, like those of Tartary and Arabia. This portion has unfortunately acquired a great extension, in consequence of the political calamities and internal feuds to which this country has been long exposed.

Of the most favored districts a traveller above cited remarks:—'The valleys of the central provinces of Persia abound with all the rarest and most valuable vegetable productions, and might be cultivated to any extent. The pasture grounds of that country are not surpassed by any lands in the world. Trees are seldom found except near towns and villages; but the luxuriance with which they grow, wherever planted, shows that the climate is congenial to them. The orchards of Persia produce all the fruits of the temperate zone, and its wilds abound with flowers that can only be reared by care and cultivation in the gardens of Europe.' The plain of Schiraz is the boast of Persia, and indeed of the eastern world; that of Ispahan is only second to it. The fruit every where may be said to be most excellent, and the gardens are cultivated with the greatest care. The vine flourishes in several provinces. The wine of Schiraz is considered superior to any other in Asia; that produced on the sides of the Caucasian mountains is also highly esteemed. Cotton, indigo, and tobacco, are also raised in various parts. Among the common vegetables are peas, beans, carrots, turnips, and cucumbers: and the potato has been lately introduced. Rhubarb, opium, senna, saffron, assafœtida. and other drugs, are also found.

In the northern provinces the mulberry is so extremely abundant as to render silk the staple produce of the empire. In these provinces considerable traces of the superior culture of former times abound. Throughout the country the husbandman, ruined by war or oppression, has often deserted his fields, and wandering tribes have descended from the mountains to occupy his place. Territories therefore formerly distinguished for fertility are now rendered wholly unfit for culture. The artificial canals, which supplied them with the necessary moisture, have been suffered to dry up: and the salt, with which the soil and waters are every where impregnated, has often accumulated and formed a species of crust on the surface of the ground, so as to render it capable of producing only soda and saline plants. Scarcely any where does the husbandman enjoy a moment's security from cheepaos or the forays of freebooters. Mr. Morier, being attacked by a predatory chief, in the plain of Shuster, defeated and carried him prisoner to Ram Hormuz. The governor of that place, however, assured him that he could not with safety take any violent measures against so powerful an individual. He even advised Mr. M. to take advantage of the incident, by engaging this person to conduct him safely through the rest of his journey, on condition of regaining his liberty; and this was found in fact the only safe measure.

Persia is noted both for its horses and dogs: the former, although neither so swift nor so beautiful as those of Arabia, excel them in size and strength. The most valuable are of the Turcoman breed; and a chupper or courier has been known to travel from Teheran to Bushire, a distance of 700 miles, on the same horse, in ten days. Superior mules, asses, and camels, are also used. The mules are small, but well shaped and strong. The camels equal those of Arabia, and are much used in all the eastern and desert part of the country; but the western regions are too mountainous for this animal. Buffaloes are found, together with large flocks of goats and sheep, in the uplands: lions, tigers, and bears, in the forests of Ghezan and Mazanderan; while beautiful zebras roam wild over many of the plains of the interior. They are extremely difficult to take. Most of the poultry of Europe is also bred in Persia, except the turkey. Insects abound in the damp and marshy places on the borders of the Caspian, near the shores of the Persian gulf, and towards the banks of the Tigris; and locusts, snakes, and scorpions, visit the southern parts.

The most extraordinary mineral production of Persia is that of naphtha or bitumen, found in pits three feet in diameter, and ten or twelve deep, which fill of themselves after a certain period. This forms a most excellent substitute for pitch. The bottoms of most of the vessels which navigate the Euphrates and Tigris are covered with it; and it is used by the natives, instead of oil, for lamps. There is also a white naphtha, which, however, is suspected to be a different substance. It is found floating, like a crust, on the surface of the water, does not possess the qualities of pitch, but affords a more agreeable light. A black and liquid petroleum, of an agreeable odor, flows in small quantity from a mountain in Kerman. The king reserves it for himself to be used in presents; and the mines are carefully sealed and guarded. The turquoise, a precious stone peculiar to Persia, is found in the mountains of Khorassan. Here also the king demands a choice of all that the mine produces; but the merchants have found the secret of evading this monopoly, and of carrying off the jewels. Silver, lead, iron, and copper, are met with in the provinces of Kerman and Mazanderan. The mineral waters of the country are entirely neglected.

The existing government of Persia is entirely absolute: the reigning king being judged the vicegerent of the prophet, and entitled to the most implicit obedience. He is absolute master of the lives and properties of his subjects; and the first man in the empire who disputes or neglects his commands may instantly be stript of his dignities, and publicly bastinadoed. The grand vizier and lord high treasurer exercise generally the executive power; but in the capital the king sits daily to administer justice. The punishments are very severe; and the barbarous system of mutilation frequent. Many of the wandering tribes, however, are ruled by their own khans, who merely pay occasional military service to the state. At a former period all the provinces were thus ruled by hereditary rulers who felt a solid interest in the welfare of the people; but these have been removed, and the new officers study only to enrich themselves. The weakness thus induced has probably been one main cause of that series of destructive revolutions to which Persia has been subject, since the reign of Shah Sophi, who made this change. The khans who still retain hereditary sway, having at their command the most warlike part of the population, are much courted by the monarch.

Persia has at the present time scarcely any thing like a regular army. The most efficient consists of the royal slaves, as they are termed with great propriety, 3000 in number, a considerable part of whom have been disciplined after the European manner. The royal guards, amounting to 10,000, have lands assigned them round the capital, and compose only a body of militia. The defence of Persia rests mainly upon the wandering tribes, who are alike excited by loyalty and the desire of plunder, to join the standard of the shah, but who often revolt to the enemy. This force, consisting entirely of cavalry, may, it is said, by a great effort, be raised to 150,000 or 200,000 men. The Persians have no idea of tactics. In their reviews the soldiers pass along one by one, and have their arms examined. In making war, they fly round the enemy, and endeavour to cut off his provisions and water; seeing him thoroughly exhausted, they make a sudden onset, and overwhelm him. Persia is always to be easily conquered, but is retained with difficulty. The Russians, like their ancient enemies, notwithstanding their superiority in the field, have never been able to extend their frontier much beyond the Araxes.

The people, though oppressed on every side, are gay, lively, and active. Their dress is much lighter than that of their Turkish neighbours, and profusely adorned with ornaments: ostentation is indeed a reigning principle. A sabre will often be made worth from 15,000 to 30,000 piastres. There is no country where the beard is regarded with equal veneration. During the day it is washed, repeatedly combed, and adjusted, for which purposes a pocket-mirror is constantly in use: the rich even adorn it with jewellery.

The Persians are the most learned and polite nation of the east. They employ in their conversation the most extravagant hyperboles: and, to make their sincerity appear the greater, they contrive, when a traveller is passing, to be overheard expatiating in his praise to a third person. Their whole conduct consists principally, we are told, of a train of fraud and artifice; and they never return to fair dealing till they find a man able to detect their impostures. Presents are looked for with great avidity.

There are two regular classes of poets, one whose theme is philosophy, and the other whose lyre is devoted to love. At the head of the former is Sadi, of the latter Hafiz. They dwell chiefly of course upon the beauties of the beloved object, which are treated in the utmost detail, upon the miseries of absence, &c. Rigid Mahometans scarcely consider it lawful to peruse the works of Hafiz. Morality is taught by proverb, apologue, and fables, usually clothed in verse. The following is their circle of sciences, according to the order in which they are studied: grammar and syntax, theology, philosophy, mathematics, and finally medicine and astrology. Their diligence in study is said to be extraordinary, and the greatest attention is paid to education. The three ranks of wise men bear the titles of Taleb, Mollah, and Moushtehed.

The whole nation are Mahometans, of the sect of Sunnites, or Ali, who, on that ground, are viewed by the Turks with greater abhorrence than Christians. The Persians, however, are not intolerant, but listen without anger to the professions or arguments of those who hold a different belief. The exception, perhaps, is in the case of the Guebres, or worshippers of fire, who are now almost extirpated; a remnant only of about 4000 being found in Yezd, and other towns of Kerman. The Persians generally have the utmost confidence in charms, talismans, sentences of Ali written upon parchment, lucky and unlucky days, &c.

To a considerable extent they are a manufacturing people, and in the brilliancy of their dyes and colors surpass the Turks, and perhaps even Europeans. To the latter they have communicated that exquisite blue tint called ultra marine. The wool produced here is manufactured into stuffs of various form and fineness; and those unrivalled carpets, to which we give the name of Turkey, are in fact wrought principally by females of the Persian tribes. The wool produced by the goats of Kerman is also made into shawls of considerable fineness. Silk is a great staple, either by itself, or mixed with cotton and wool; and the Persians excel in brocade, embroidery, and tapestry of all kinds. Muskets, pistols, and carabines, are made and mounted in most of the great towns: and Khorassan contains a manufactory of sword blades, the founders of which were, it is said, transported from Damascus by Timur. Leather, paper, and porcelain, nearly equal to that of China, are also among the manufactures. Bushire is now the only Persian port in the gulf, the chief commerce of which is carried on by way of Bussora. The commercial intercourse of Persia is, therefore, chiefly carried on by caravans with Turkey, Tartary, and India.

The PERSIAN GULF.—The Gulf of Persia (Sinus Persicus) is entered from the Gulf of Muscat through the Strait of Ormus, eleven leagues wide, between Cape Mussendom and Cape Bambaruck on the Persian shore. This gulf differs from the Red Sea in being almost entirely free from coral reefs, though it has many islands. It is beyond the limits of the monsoons, but the position and nature of the neighbouring countries produce periodical winds, which blow up and down the gulf as in the Red Sea, north-west winds prevailing for nine months, from October to July, and south-east the other three months. The former is called by the Arabs shimaul, and the latter shurquee. For about forty days, commencing at the middle of June, the north-west wind blows with great violence, and is called the grand shimaul. In March and April these winds also blow very strong for about twenty days without intermission; and at this time the current sets strong up the gulf against the wind. During the period of the prevailing south-east winds, hard but transient gales from the south-west are sometimes experienced towards the entrance of the gulf. The currents are observed to run into the gulf from May to September; and out during the rest of the year. In the middle of the gulf the current generally sets down, but is weak: along the shores small tides prevail. The prevailing winds seem to depend on the nature of the neighbouring countries, and the position of the gulf north-west and south-east. To the south-east and east are the Arabian Sea and the sandy deserts of Persia, the atmosphere of which must be more rarified for a greater part of the year than that to the north and north-west, where are the Black and Caspian Seas and the cold Caucasus: hence north-west winds prevail the greater part of the year, and are strongest in the summer months, when the air to the south is most rarified by the sea being vertical, and by the melting of the northern snows and ices, producing a stream of condensed air. In the gulf are many springs of fresh water in the sea, particularly one near the Isles of Bahrein.

The Persian Gulf receives at its head the united waters of the two great rivers, Tigris and Euphrates, which have both their sources in the mountains of Caucasus, between the Caspian and Black Seas. Their junction takes place at Korna, thirty leagues above Bussora, and the united waters take the name of the Shat-al-Arab (River of the Arabs) to the sea, into which they empty themselves, amongst banks, by several mouths; of which the western one alone is navigable by ships, and is distinguished from the others by the branches of date trees floating out of it with the stream: its greatest depth is twenty feet, and for twenty-five leagues from its mouth it is free from banks. The other branches are only navigable by boats. The land at the mouth of the river is so low that the date trees are the first objects seen, and in general these trees cover the banks up to Bussora, with a few interspersed patches of rice ground. Vessels of seventy tons go from Bussora to Bagdad; these vessels, from the scarcity of wood, are composed of pieces of every size and species, from the size of a barrel stave upwards, and the whole is covered with dammer, a species of resin used in India instead of pitch, an inch thick, which keeps them from leaking.

The Arabian coast of the gulf, from the Strait of Ormus to Aftan River, 400 miles, is occupied by the Jochassim pirates, whose chief places of rendezvous are Ejmaum, a small town and good port, and Noseilkam, ten leagues from Ejmaum. The sheik of Julfar, whose territory is outside the gulf, on the west of Cape Mussendom, has also a number of pirate dows, mounting four to eighteen guns; but the most powerful of these piratical chiefs is the Chaub, whose capital is Durac (thought to be the Siwa of Alexander), on the east bank of the Euphrates.

The west shore of the Persian Gulf is always avoided by European ships, and consequently is little known. For a distance of sixty leagues from Cape Mussendom there is not known to be any place of shelter. Ras-el-Khima is a large pirate town, on a sandy peninsula, and is, comparatively with other Arab towns, strongly fortified with batteries and towers. In 1809 the British Indian government determined to chastise those pirates, who had long committed depredations on the English trade, and even captured some of the Company's vessels of war, treating the crews with great cruelty; an expedition was consequently sent from Bombay, and their capital, El Khima, was taken by assault, and the fortifitions destroyed, together with seventy of their piratical dows. A considerable plunder fell into the hands of the captors, whose loss was only one officer killed, and four men wounded. In latitude about 25° is a place called Seer, with the island Zare to the west; the Pearl Bank is thought to commence here, and extends along the coast to latitude about 27°. There are many insignificant towns on the coast, from which the pearl fishery is carried on. The most considerable are Lahsa, on Aftan River; Farut, celebrated for its grapes; El-Katif, supposed to be the ancient Gerra, built of salt stone, and where the ruins of a Portuguese fort are seen; Grain, Gran, or Koueit, is forty leagues from El Katif; the coast between is desert, and with many islands. Gran is a town of mats and poles, with 10,000 inhabitants, engaged in the pearl fishery to a considerable extent. Here the East India Company's packets usually wait for the over-land despatches from England.

Bussora, Bassora, Basra or Busra, called by the Arabs Al Sure, or the rocky, from the nature of the surrounding country, is a straggling Arab town, ninety miles from the sea, and one mile and a half from the west bank of the river of the Arabs. A creek runs from the river to the town, by which vessels of seventy tons ascend to the latter. The houses are of sun-dried bricks, with terraced clay roofs, and of a mean appearance. The country round is a level plain, and, except on the immediate banks of the river, without tree or shrub. The climate is not considered healthy; the summers are extremely hot, and the winters cold and wet: the extremes of the thermometer are 110° to 50°. The trade of Bussora is very considerable, it being the principal emporium of the commerce between India and the Turkish dominions. The English East India Company have a factory here.

Cape Jasques, which forms the eastern side of the Strait of Ormus, has a square white perforated cliff, like a tower, projecting into the sea. East of the cape a river empties itself into the north-west angle of Jasques Bay. Its mouth is crossed by a bar, with but seven or eight feet high-water, and four fathoms and a half within. The Persian shore of the gulf, towards its entrance, is occupied by Arabs, generally independent of the Persian dominion, who subsist by navigation, fishing, and piracy. Ascending the Persian shore of the gulf, the places of any note, in succession, are Mina, on the River Ibrahim. Gombroon, or Bender Abassi (Port of Abbas), was formerly a celebrated mart, but at present is nearly deserted, and in ruins. It is situated at the foot of a hill opposite Kismish Island, is unhealthy, and without water, but what is preserved in cisterns from the rains. Kongon, or Kungoon, is a considerable town, with some trade; the coast is here lined with stupendous mountains, rugged and barren. Cape Verdistan, or Burdistan, has a shoal running out from it three leagues to the south.

Bushire (Bender Abou-scher), the principal fort of the Persians in the gulf, is an ill-built town of 1200 houses, of white stone or sun-burnt bricks, surrounded by a wall with some bastions, merely sufficient to protect it from the insults of the Arabs. It is built on a point of land which is insulated in high tides. Vessels of ten feet draft run up the river to the town, but those of burden cannot approach the river's mouth nearer than five miles. The water procured here is extremely brackish, though brought ten miles from the town. The remains of the Portuguese factory and castle are still to be seen, as are the ruins of Reeshire, a large town in the time of their power, four miles south of Bushire. The English East India Company have a resident here. Its trade is considerable, being properly the seaport of Schiraz, with which it has a constant commercial communication by caravans, and from it Persia is principally supplied with India merchandise, for which it pays in specie.

The Gulf of Persia has, as we have said, several islands of note, of which the first towards the entrance is the celebrated Ormus, six miles long, and two leagues from Bender-Abassi. It is a totally barren rock, the low parts of which are covered with a crust of salt resembling snow. Its inhabitants are few, and chiefly subsist by collecting sulphur, of which they furnish cargoes to some small vessels. They are dependent for fresh water on what is preserved in cisterns in the rains.

Larak Isle, a league south-west of Ormus.

Kishmish (Oaracta), the largest island in the gulf, is twenty leagues long east and west, but not two broad; it is populous and well cultivated, producing wheat and other grain. On the east side is a good port named Congo, but fit only for small vessels; it has however a spring of excellent water, almost the only one in the gulf. Near the middle of the south side is Angar Isle, three miles long, occupied by wild sheep and hogs.

Mamouth and Selim, also called Mamet and Salamet, Kaze and Nabajou, and by English seamen the tombs, the ancient Aradus, are two small isles three leagues from the west side of Kismish.

Poliore and Knobflore, also called Souri and Abou-mousa, are barren islets. Souri looks like a two masted vessel.

Kyen, or Keish Island, is low, fruitful, and inhabited.

Busheab, or Sheik-Saib, is of considerable size, well inhabited, and covered with date trees. On the east side is a town occupied by pirates.

Karek, or Kharedje (Icarah), north of Bushire, is three leagues long and two broad, has 1500 inhabitants, and is tolerably cultivated, producing wheat, rice, and barley; it abounds with goats, but has few other animals. On the north are the ruins of a Dutch factory, established between 1750 and 1765. The island at present is subject to the sheik of Bushire; on its south side is fresh water, convenient for shipping. Pilots are usually taken here for Bussora. In the centre of the island is a hill, with coral and sea shells on its summit, and courses of lava are observed on its sides. The isles Bahrein, Baharein, are, as their name signifies, two in number; they lie before Aftan River, five leagues from the main. The largest, named Anal by the Arabs, the ancient Tylos, is level, covered with date trees, and has a fortified town. The south-east, and smallest, is called Samak; they are celebrated for the great pearl fishery carried on near them; they are subject to the sheik of Bushire.

Persian Language. The claims and characters of this important dialect of human speech have been so well illustrated and enforced in modern times, and especially by Sir W. Jones, that we cannot withhold an abridged view of them in this place.

The history of the *Persian language*, according to Sir W. Jones, may be divided into four periods, like that of the empire; under each dynasty there was an apparent change in the dialect of the kingdom, especially under the two last, viz. the 'Sassanian' and 'Mahometan' dynasties; and these are the only periods of which any certain records remain.

In the infancy of the empire, under Cayúmaras and his descendants, it cannot be supposed that any great pains were taken to polish the language. Herodotus assures us that, even after the reign of Cyrus, the whole education of the Persian youth, from the age of five years to twenty, consisted in only three points, riding, throwing the javelin, and the practice of moral virtue; which account is also confirmed by Xenophon. It ought not, however, to be imagined, that the ancient Persians, especially those of the second period, were entire strangers to the art of composition either in verse or prose; but what their language was, what were their rules of versification, or what was the course of their studies, no mortal can pretend to know with any shadow of exactness. The Greeks can give us no assistance, nor are we much enlightened by the writers after Alexander; it is necessary therefore to consult the Persians themselves. From the great traveller Chardin, we learn, that the old Persian is a language entirely lost, in which no books are extant. We have therefore no account of the Persian language till the time of the Sassanian kings, who flourished from the opening of the third century to the middle of the seventh, during which period an academy of physic was founded at Gandisapor, a city of Korosan, and, as it gradually declined from its original institution, it became a school of poetry, rhetoric, dialectics, and the abstract sciences. In this seminary the Persian tongue must have been much refined, and the rusticity of the old idiom was succeeded by a pure and elegant dialect, which being constantly spoken at the court of Beharam Gúr in the year 351, acquired the name of Deri, or courtly, to distinguish it from the pehlavi, pahlavi, or language of the country. This idiom did not, however, supersede the ancient dialect; for several compositions in Pahlavi were extant even after Mahomet, which appear to have been written by order of the Sassanian princes. Anushirvan, surnamed the Just, who reigned at the close of the sixth century, when Mahomet was born, obtained from India a collection of fables, translated by his chief physician from the Sanscrit language, which he acquired for this purpose; this collection he translated into the Pahlavian dialect; about 140 years after it was turned from Pehlavi into Arabic, by order of Almansor, second caliph of the Abassides; and this is the volume now found in every language of Europe, under the name of Calila wa Demma, or the fables of Pilpay. In the reign of Anashirvan Mahomet polished the language of his country; and, when the battle of Cadessia gave the last blow to the Persian monarchy, the whole empire of Iran was reduced under the power of the first Mahometan dynasty: the ancient literature of Persia, which had been promoted by the family of Sassan, was immediately discouraged by the successors of Mahomet; because some Persian romances, brought into Arabia, were extolled to the disparagement of the Koran, the people to whom they were read alleging, that 'the stories of griffons and giants were more amusing to them than the moral lessons of Mahomet.' Accordingly a chapter of the Koran was immediately written to stop the progress of these opinions, and other measures were taken to check their diffusion. This is supposed to have been the moving cause of that enthusiasm of the Mahometans which induced them to burn the famous library of Alexandria, and the records of the Persian empire. It was a long time before the native Persians could recover from the shock of this violent revolution; and their language seems to have been little cultivated under the caliphs, who gave greater encouragement to the literature of the Arabians; but when the power of the Abassides began to decline, and a number of independent princes arose in the different provinces of their empire, the arts of elegance, and chiefly poetry, revived in Persia; and there was hardly a prince, or governor of a city, who had not several poets and men of letters in his train. The Persian tongue was consequently restored in the tenth century; but it was very different from the Deri or Pehlavi of the ancients; it was mixed with the words of the Koran, and with expressions from the Arabian poets, whom the Persians considered as their masters, and affected to imitate in their poetical measures, and the turn of their verses.

The oldest Persian poems, of which Sir W. Jones obtained any knowledge, are those of Ferdúsi, and which, in his account of them, are exhibited as a glorious monument of eastern genius and learning; and of which he further says, that if it should be generally understood in its original language, will contest the merit of invention with Homer himself, whatever be thought of its subject, or the arrangement of its incidents. He has furnished an extract from this poem, and adds, that it will exhibit a specimen of the Persian tongue very little adulterated by a mixture with the Arabic, and in all probability approaching nearly to the dialect used in Persia in the time of Mahomet, who admired it for its extreme softness, and was heard to say, 'that it would be spoken on that account in the gardens of Paradise.' Of these two languages was formed the modern dialect of Persia, which being spoken in its greatest purity by the natives of Pars or Farsistan, acquired the name of Parsi; though it is even called Deri by Hafiz. Nearly in the same age, viz. at the close of the tenth and beginning of the eleventh centuries, the great Aleul Ola, surnamed Alámi from his blindness, published his excellent odes in Arabic, in which he professedly imitated the poets before Mahomet. At this time, and soon after, the Persian language became altogether mixed with Arabic. At Shiraz, called the Athens of Persia, flourished in the thirteenth century, Sadi, a native of this city; who wrote several pieces, both in prose and verse; and by means of an extract from his Gulistan, or Bed of Roses, Sir W. Jones has shown us how the Persian and Arabic languages were mixed together in his age. The same city had the honor of producing, in the fourteenth century, the most elegant lyric poet of Asia, Shemseddin, surnamed Hafiz; of whose productions Sir W. Jones has transcribed two Gazals or anacreontic odes, with a translation. There is nothing, says our author, which affords a stronger proof of the excellence of the Persian tongue than that it remained uncorrupted after the irruption of the Tartars, who at different times, and under various leaders, made themselves masters of Persia; for the Tartarian princes, and chiefly Tamerlane, who was a patron of Hafiz, were so far from discouraging polite literature, like the Goths and Huns, that they adopted even the language and religion of the conquered country, and promoted the fine arts with a boundless munificence; and one of them, who founded the Mogul empire in Hindostan, introduced the Persian literature into his dominions, where it flourishes to this day; and all the letters from the Indian governors are written in the language of Sadi. The Turks themselves improved their harsh dialect by mixing it with the Persian; and Mahomet II., who took Constantinople in the middle of the fifteenth century, was a protector of the Persian poets, among whom was Noureddin Jami, whose poem On the Loves of Joseph and Zelikha is very highly extolled by our author, who has given a specimen of his elegant style. In the sixteenth and seventeenth centuries, under the family of Sesi, the Persian language began to lose its ancient purity, and even to borrow some of its terms from the Turkish, which was commonly spoken at court.

The characters of the Persian language are written from right to left, and the language consists of thirty-two letters, which vary in their form as they are initials and medials, or finals, both connected and unconnected. For the pronunciation both of the consonants and vowels, we refer to Sir William Jones's Grammar, from which we make the following extracts.

The short vowels are seldom written in the Persian books, and the omission of them occasions a perplexity to the learner of the language. He will soon perceive with pleasure a great resemblance between the Persian and English languages, in the facility and simplicity of their form and construction. The former, as well as the latter, has no difference of termination to mark the gender, either in substantives or adjectives: all inanimate things are neuter, and animals of different sexes either have different names, or are distinguished by certain words, denoting male and female.

The Persian substantives, like ours, have but one variation of case, which is formed by adding a certain syllable to the nominative in both numbers; and answers often to the dative, but generally to the accusative case in other languages. When the accusative is used indefinitely, this syllable is omitted; but when the noun is definite or limited, that syllable is added to it. In Persian there is no genitive case; but when two substantives of different meanings come together, a hesra, or short *e*, is added in reading to the former of them, and the latter remains unaltered. The same rule must be observed before a pronoun possessive, and before an adjective. The other cases are expressed, for the most part, as in our language, by particles placed before the nominative. Our article *a* is supplied in Persian by adding the letter *ya*, or as it is sounded *ee*, to a noun, which restrains it to the singular number.

The Persian plural is formed by adding certain characters for syllables to the singular: but these terminations are not, as in many languages, wholly arbitrary; on the contrary, they are regulated with the utmost precision. It must not be omitted that the Arabic substantives frequently have two sorts of plurals: one formed according to the analogy of the Persian nouns, and another after the irregular manner of the Arabians; and this circumstance, besides several others, proves the impossibility of learning the Persian language accurately, without a moderate knowledge of the Arabic: and Sir William Jones advises the learner to peruse with attention the Arabic grammar of Erpenius, of which there are two fine editions, one by Golius, and another by Albert Schultens, before he attempts to translate a Persian manuscript.

The Persian adjectives admit of no variation, but in the degrees of comparison. The positive is made comparative by adding to it one character for a syllable, and superlative by means of another. An adjective is sometimes used substantively, and forms its plural like a noun; if it be a compound adjective, the syllables denoting the plural number and the oblique case are placed at the end of it.

The personal pronouns are, 1, *men*, I: thus, sing. *men*. I; plur. *ma*, we; obl. *merá*, me, *mára*, us. 2. *To*, thou: thus, sing. *to*, thou; plur. *shumá*, you or ye; obl. *tura*, thee; *shumará*, you. 3. *O*, he: thus, sing. *o*, he, she, or it; plur. *ishán*, they; obl. *óra*, him, her, or it; *ishánra*, them. The possessives are the same with the personals, and are distinguished by being added to their substantives. Our reciprocal pronouns, *own* and *self*, are expressed in Persian by certain words, which are applicable to all persons and sexes. For the demonstrative pronouns *this*, *these*, *that*, *those*, in the several cases singular, plural, and oblique, there are appropriate characters or expressions. Certain syllables prefixed to pronouns personal change them into possessives, and are read with a short vowel. The relatives and interrogatives are supplied by the invariable pronouns *ke* and *che*; of which the former usually relates to persons, and the latter to things.

The Persians have active and neuter verbs, like other nations; but many of their verbs have both an active and neuter sense, which can be determined only by the construction. These verbs have properly but one conjugation, and but three changes of tense, the imperative, the aorist, and the preterite: all the other tenses being formed by the help of certain particles, or of the auxilliary verbs signifying *to be*, and *to be willing*. The passive voice is formed by adding the tenses of the verb substantive to the participle preterite of the active. Our author has exhibited the inflexions of the auxiliary verbs, and an analysis of all the tenses of a Persian verb, showing in what manner they are deduced from the infinitive, which is properly considered by the oriental grammarians as the spring and fountain of all the moods and tenses, and which, therefore, in Arabic is called the masdar, or the source. The Persians are very fond of the participle preterite; and it is very often used by their elegant writers to connect the members of a sentence, and to suspend the sense till the close of a long period. In poetry it sometimes is used like the third person preterite of a verb. Our author has subjoined a table of the moods and tenses, as they answer to those of European languages.

In the ancient language of Persia there were very few or no irregularities: the imperative, which is often irregular in the modern Persian, was anciently formed from the infinitive, by rejecting the termination *eeden*; for originally all infinitives ended in *den*, till the Arabs introduced their harsh consonants before that syllable, which obliged the Persians, who always affected a sweetness of pronunciation, to change the old termination of some verbs into *ten*, and by degrees the original infinitives grew quite obsolete; yet they still retain the ancient inperatives, and the aorists which are formed from them. This little irregularity is the only anomalous part of the Persian language, which, nevertheless, far surpasses in simplicity all other languages, as Sir William Jones says, ancient or modern, of which he has any knowledge.

One of the chief beauties of the Persian language is the frequent use of compound adjectives; in the variety and elegance of which it surpasses not only the German and English but even the Greek. These compounds are thought so beautiful by their poets that they sometimes fill a distich with them.

The construction of the Persian tongue is very easy, and may be reduced to a few rules, most of which it has in common with other languages. The nominative is usually placed before the verb, with which it agrees in number and person. It is remarked, however, that many Arabic plurals are considered in Persian as nouns of the singular number, and agree as such with verbs and adjectives. Another irregularity in the Persian syntax is, that the cardinal numbers are usually joined to nouns and verbs in the singular. The adjective is placed after its substantive, and the governing noun is prefixed to that which it governs. Conjunctions which express conjecture, condition, will, motive, &c., require the conjunctive or potential mood. Prepositions and interjections are fixed to nouns in the nominative case. The modern Persians borrowed their poetical measures from the Arabs, and they are very various and complicated.

The Persian elegy differs only in its length from the ode, except that the cassideh often turns upon lofty subjects, and the gazal comprises for the most part the praises of love and merriment, like the lighter odes of Horace and Anacreon. Sir William Jones, among other numerous translations, has given us a translation in verse of a beautiful Persian song by Hafiz. But we must now content ourselves with referring to the close of Sir William Jones's Persian Grammar, or to his Works, vol. 5, for further information on these interesting topics.

PERSIAN WHEEL. See HYDROSTATICS.

PERSICA, the peach, is by Linnæus referred to the same class and genus with amygdalus; however, as they are reckoned different genera, by Tournefort and others, we shall here mention the three principal species of the persica most remarkable for the beauty of their flowers. 1. P. Africana, the double-flowering dwarf almond. 2. P. humilis, the dwarf almond. These two reach not above the height of three or four feet, though their flowers are of equal beauty with the 3. P. vulgaris, the common peach tree, with double flowers. It is a very great ornament in gardens, producing very large double flowers of a beautiful red or purple color, and growing to a considerable size. Numerous other species of peach trees, with their culture, uses, &c., are described under AMYGDALUS.

PERSICARIA, in botany. See POLYGONUM.

PERSICUM MARE, or PERSICUS SINUS, in ancient geography, a part of the sea which the Romans called Mare Rubrum, and the Greeks Mare Erythræum; washing Arabia Felix on the east, between which and Carmania, entering into the land, it washes Persia on the south. Its large mouth consists of straight sides, like a neck, and then the land retiring equally a vast way, and the sea surrounding it in a large compass of shore, there is exhibited the figure of a human head (Mela). Theophrastus calls this bay Sinus Arabicus.

PERSIMON. See DIOSPYROS. From the persimon is made a very palatable liquor in the following manner:—As soon as the fruit is ripe a sufficient quantity is gathered, which is very easy, as each tree is well stocked with them. These persimon apples are put into a dough of wheat or other flour, formed into cakes; and put into an oven, in which they continue till they are quite baked and sufficiently dry, when they are taken out again: then, in order to brew the liquor, a pot full of water is put on the fire, and some of the cakes are put in: these become soft by degrees as the water grows warm, and crumble in pieces at last; the pot is then taken from the fire, and the water in it well stirred about, that the cakes may mix with it: this is then poured into another vessel, and they continue to steep and break as many cakes as are necessary for a brewing: the malt is then infused, and they proceed as usual with the brewing. Beer thus prepared is reckoned much preferable to other beer. They likewise make brandy of this fruit in the following manner: Having collected a sufficient quantity of persimons in autumn they are altogether put into a vessel, where they lie for a week till they are quite soft; then they pour water on them, and in that state they are left to ferment of themselves, without any addition. The brandy is then made in the common way, and is said to be very good, especially if grapes (in particular of the sweet sort), which are wild in the woods, be mixed with the persimon fruit. Some persimons are ripe at the end of September, but most of them later, and some not before November and December, when the cold first overcomes their acrimony. The wood of this tree is very good for joiners' instruments, such as planes, handles to chisels, &c., but if after being cut down it lies exposed to sunshine and rain, it is the first wood which rots, and in a year's time there is nothing left but what is useless. When the persimon trees get once into a field, they are not easily got out of it again, as they spread greatly.

PERSIS, a Roman lady, whom St. Paul salutes in his epistle to the Romans (xvi. 12), and calls his beloved sister. She is not honored by any church, which is something singular.

PERSIS, in ancient geography, a province of Persia, bounded by Media, Carmania, Susiana, and the Persian Gulf. It is used by some authors for Persia itself.

PERSIST', *v. n.*
PERSIST'ANCE, *n. s.*
PERSIST'ENCY,
PERSIST'IVE, *adj.*
Lat. *persisto*; Fr. *persister*. To persevere; continue firm; not to desist: the noun substantive and adjective follow these senses.

Thou thinkest me as far in the devil's book, as thou and Falstaff, for obduracy and *persistency*.
Shakspeare.

The protractive tryals of great Jove,
To find *persistive* constancy in men. *Id.*

The love of God better can consist with the indeliberate commissions of many sins, than with an allowed *persistance* in any one.
Government of the Tongue.

If they *persist* in pointing their batteries against particular persons, no laws of war forbid the making reprisals. *Addison.*

Nothing can make a man happy but that which shall last as long as he lasts: for an immortal soul shall *persist* in being, not only when profit, pleasure, and honour, but when time itself shall cease.
South.

PERSIUS FLACCUS (Aulus), a Latin poet in the reign of Nero, celebrated for his satires. He was born, according to some, at Volterra in Tuscany; and, according to others, at Tigulia, in the gulf of Specia, in the year 34. He was educated till twelve years old at Volterra; and afterwards at Rome, under Palæmon the grammarian, Virginius the rhetorician, and Cornutus the stoic, who contracted a friendship for him. Persius consulted that illustrious friend in the composition of his verses. Lucian also studied with him under Cornutus; and was so charmed with his verses that he was incessantly breaking out into acclamations at the beautiful passages in his satires. He was a steady friend, a good son, an affectionate brother and parent. He was chaste, meek, and modest: which shows how wrong it is to judge of a man merely by his writings; for the satires of Persius are not only licentious, but sharp and acrimonious. Persius was of a weak constitution, and troubled with a weak stomach, which was the cause of his death in the thirtieth year of his age. Six of his satires remain; in their judgments of which the critics have been much divided, excepting as to their obscurity. Yet his style is grand, figurative, poetical, and suitable to the dignity of the stoic philosophy: and hence he shines most in recommending virtue.

PER'SON, *n. s.*
PER'SONABLE, *adj.*
PER'SONAGE, *n. s.*
PER'SONAL, *adj.*
PERSONAL'ITY, *n. s.*
PERSONA'TION,
PERSONIFICA'TION,
PERSON'IFY, *v. a.*
Fr. *personne*; Ital. Span. and Lat. *persona*. An individual human being; see the extracts from Locke; a man or woman considered as opposed to, or distinct from, things; or considered as present; one's own self, appearance, character, or office; in grammar, a quality of the noun which modifies the verb: personable means of good or handsome person; graceful: personage (Fr. *personage*), a considerable or eminent person; exterior character or appearance; stature: personal belonging to a human being; proper to an individual; present; real; corporeal; external; in law, that which is moveable or supposed appendant to the person; not real; not land: in grammar, a personal verb is that which has all the regular modifications of the three persons; opposed to an impersonal one, that has only the third: personality is individuality; individual existence; it is also used in modern parlance for personal reflection or remark: personally follows the senses of personal: to personate is represent; pass for a given or supposed person; hence pretend; counterfeit; represent as in a picture; describe: but the last senses are disused: personation is used by Bacon for counterfeiting another's person: personification is, in rhetoric, prosopopœia, the change of things to persons, as 'Confusion heard his voice:' to personify is, thus to change a thing, or give it personal attributes.

Him that accepteth not the *persons* of princes, nor regardeth the rich more than the poor. *Job.*

Dorus the more blushed at her smiling, and she the more smiled at his blushing; because he had, with the remembrance of that plight he was in, forgot in speaking of himself the third *person*.
Sidney.

It was a new sight fortune had prepared to those woods, to see these great *personages* thus run one after the other. *Id.*

All things are lawful unto me, saith the apostle, speaking, as it seemeth, in the *person* of the Christian gentile for the maintenance of liberty in things indifferent. *Hooker.*

Every man so termed by way of *personal* difference only. *Id.*

Approbation not only they give, who *personally* declare their assent by voice, sign, or act, but also when others do it in their names. *Id.*

If I am traduced by tongues which neither know
My faculties nor *person*;
'Tis but the fate of place, and the rough brake
That virtue must go through. *Shakspeare.*

For her own *person*,
It beggared all description. *Id.*

I then did use the *person* of your father;
The image of his power lay then in me:
And in the administration of his law,
While I was busy for the commonwealth,
Your highness pleased to forget my place. *Id.*

She hath made compare
Between our statures, she hath urged his height
And with her *personage*, her tall *personage*,
She hath prevailed with him. *Id.*

For my part,
I know no *personal* cause to spurn at him;
But for the general. *Id. Julius Cæsar.*

The fav'rites that the absent king
In deputation left,
When he was *personal* in the Irish war.
Shakspeare.

I could not *personally* deliver to her
What you commanded me, but by her woman
I sent your message. *Id. Henry VIII.*

The lofty cedar *personates* thee. *Shakspeare.*

I am thinking what I shall say; it must be a *personating* of himself; a satire against the softness of prosperity. *Id.*

Were it true that her son Ninias had such a stature, as that Semiramis, who was very *personable*, could be taken for him; yet it is unlikely that she could have held the empire forty-two years after by any such subtilty. *Raleigh.*

The rebels maintained the fight for a small time, and for their *persons* shewed no want of courage. *Bacon.*

When I purposed to make a war by my lieutenant, I made declaration thereof to you by my chancellor; but now that I mean to make a war upon France in *person*, I will declare it to you myself. *Id. Henry VII.*

From his first appearance upon the stage, in his new *person* of a sycophant or juggler instead of his former *person* of a prince, he was exposed to the derision of the courtiers and the common people. *Bacon.*

She bore a mortal hatred to the house of Lancaster, and *personally* to the king. *Id.*

This lad was not to *personate* one, that had been long before taken out of his cradle, but a youth that had been brought up in a court, where infinite eyes had been upon him. *Id.*

This being one of the strongest examples of a *personation* that ever was, it deserveth to be discovered and related at the full. *Id.*

This sin of kind not *personal*,
But real and hereditary was. *Davies.*

He hath put on the *person* not of a robber and murtherer, but of a traitor to the state. *Hayward.*

The lord Sudley was fierce in courage, courtly in fashion, in *personage* stately, in voice magnificent, but somewhat empty of matter. *Id.*

It is not easy to research the actions of eminent *personages*, how much they have blemished by the envy of others, and what was corrupted by their own felicity. *Wotton.*

Herself a while she lays aside, and makes
Ready to *personate* a mortal part. *Crashaw.*

Piety is opposed to that *personated* devotion under which any kind of impiety is disguised. *Hamm.*

Thus have I played with the dogmatist in a *personated* scepticism. *Glanville's Scepsis.*

This was then the church which was daily increased by the addition of other *persons* received into it. *Pearson.*

It is hard to *personate* and act a part long; for, where truth is not at the bottom, nature will always be endeavouring to return, and will peep out and betray herself one time or other. *Tillotson.*

'Tis in her heart alone that you must reign;
You'll find her *person* difficult to gain. *Dryden.*

The king in *person* visits all around,
Comforts the sick, congratulates the sound,
And holds for thrice three days a royal feast. *Id.*

A *person* is a thinking intelligent being, that has reason and reflection, and can consider itself as itself, the same thinking thing in different times and places. *Locke.*

If speaking of himself in the first *person* singular has so various meanings, his use of the first *person* plural is with greater latitude. *Id.*

It could not mean, that Cain as elder had a natural dominion over Abel, for the words are conditional; if thou doest well: and so *personal* to Cain. *Id.*

Person belongs only to intelligent agents, capable of a law, and happiness and misery: this *personality* extends itself beyond present existence to what is past, only by consciousness, whereby it imputes to itself past actions, just upon the same ground that it does the present. *Id.*

A zeal for *persons* is far more easy to be perverted, than a zeal for things. *Sprat.*

How different is the same man from himself, as he sustains the *person* of a magistrate and that of a friend! *South.*

The great diversion is masking; the Venetians, naturally grave, love to give into the follies of such seasons, when disguised in a false *personage*. *Addison.*

This heroic constancy determined him to desire in marriage a princess, whose *personal* charms were now become the least part of her character. *Id.*

Our Saviour in his own *person*, during the time of his humiliation, duly observed the Sabbath of the fourth commandment, and all other legal rites and observations. *White.*

This immediate and *personal* speaking of God Almighty to Abraham, Job, and Moses, made not all his precepts and dictates, delivered in this manner, simply and eternally moral; for some of them were *personal*, and many of them ceremonial and judicial. *Id.*

Public reproofs of sin are general, though by this they lose a great deal of their effect; but in private conversations the applications may be more *personal*, and the proofs when so directed come home. *Rogers.*

The converted man is *personally* the same he was before, and is neither born nor created a-new in a proper literal sense. *Id.*

To that we owe the safety of our *persons* and the propriety of our possessions. *Atterbury.*

It has been the constant practice of the Jesuits to send over emissaries, with instructions to *personate* themselves members of the several sects amongst us. *Swift.*

Some persons must be found out, already known by history, whom we may make the actors and *personages* of this fable. *Broome.*

Be a *person's* attainments ever so great, he should always remember that he is God's creature. *Clarissa.*

If he imagines there may be no *personal* pride, vain fondness of themselves, in those that are patched and dressed out with so much glitter of art or ornament, let him only make the experiment. *Law.*

These fables Cicero pronounced, under the *person* of Crassus, were of more use and authority than all the books of the philosopher. *Baker on Learning.*

Sir Robert Walpole rewarded him with twenty guineas; a much greater sum than he afterwards obtained from a *person* of yet higher rank. *Johnson.*

His works are such as a writer bustling in the world, showing himself in public, and emerging occasionally from time to time into notice, might keep alive by his *personal* influence. *Id.*

Is it possible, gentlemen, that *persons* of so acute understandings as those who were arrayed against me to-day, should not see, that if a minister ought not to be a member of parliament, the converse would be equally true, that the crown ought not to choose a member of parliament for its minister? And what would be the consequence? *Canning.*

PERSON, in grammar, is applied to such nouns or pronouns as, being either prefixed or understood, are the nominatives in all inflections of a verb; or it is the agent or patient in all finite or personal verbs. See ENGLISH LANGUAGE.

PERSONAL ACTION, in law, is an action levied directly and solely against the person; in opposition to a real or mixed action. See ACTION.

PERSONAL GOODS or CHATTELS, in law, signifies any moveable thing belonging to a person, whether alive or dead. See CHATTELS.

PERSONATÆ, the fortieth order in Linnæus's Fragments of Natural Method, consisting of plants whose flowers are furnished with an irregular gaping or grinning petal, which in figure somewhat resembles the snout of an animal (see BOTANY, Index). Most of the genera of this order are arranged under the class and order didynamia angiospermia. The rest, although they cannot enter into that artificial class and order, for want of the classic character, the inequality of the stamina; yet, in a natural method, which admits of greater latitude, may be arranged with those plants which they resemble in their habit and general appearance, and particularly in the circumstances expressed in that title.

PERSONIFICATION, PERSONIFYING, or PERSONALISING, the giving an inanimate being the figure, sentiments, and language of a person. See ORATORY. Dr. Blair, in his Lectures on Rhetoric, gives this account of personification. 'It is a figure the use of which is very extensive, and its foundation laid deep in human nature. At first view, and when considered abstractedly, it would appear to be a figure of the utmost boldness, and to border on the extravagant and ridiculous. For what can seem more remote from the tract of reasonable thought than to speak of stones and trees, and fields and rivers, as if they were living creatures, and to attribute to them thought and sensation, affections and actions? One might imagine this to be no more than childish conceit, which no person of taste could relish. In fact, however, the case is very different. No such ridiculous effect is produced by personification when properly employed; on the contrary, it is found to be natural and agreeable, nor is any very uncommon degree of passion required in order to make us relish it. All poetry, even in its most gentle and humble forms, abounds with it. From prose it is far from being excluded; nay, in common conversation, very frequent approaches are made to it. When we say, the ground thirsts for rain, or the earth smiles with plenty; when we speak of ambition's being restless, or a disease being deceitful; such expressions show the facility with which the mind can accommodate the properties of living creatures to things that are inanimate, or to abstract conceptions of its own forming.' The Doctor goes on to investigate the nature of personification at considerable length. And he adds a very proper caution respecting the use of it in prose compositions, in which this figure requires to be used with great moderation and delicacy. The same liberty is not allowed to the imagination there as in poetry. The same assistances cannot be obtained for raising passion to its proper height by the force of numbers and the glow of style. However, addresses to inanimate objects are not excluded from prose; but have their place only in the higher species of oratory. A public speaker may on some occasions very properly address religion or virtue; or his native country, or some city or province, which has suffered perhaps great calamities, or has been the scene of some memorable action. But we must remember that, as such addresses are among the highest efforts of eloquence, they should never be attempted unless by persons of more than ordinary genius: for if the orator fails in his design of moving our passions by them, he is sure of being laughed at. Of all frigid things, the most frigid are the awkward and unseasonable attempts sometimes made towards such kinds of personification, especially if they be long continued.'

PERSPECTIVE.

PERSPECTIVE, *n. s.* Fr. *perspectif;* Lat. *perspicio.* A glass through which objects are viewed; the view taken; the science of delineating objects on a plane.

We have *perspective* houses, where we make demonstrations of all lights and radiations; and out of things uncoloured and transparent, we can represent unto you all separate colours. *Bacon.*

If it tend to danger, they turn about the *perspective* and show it so little, that he can scarce discern it. *Denham.*

It may import us in this claim, to hearken to the storms rising abroad; and by the best *perspectives*, to discover from what coast they break. *Temple.*

You hold the glass, but turn the *perspective*,
And farther off the lessened object drive. *Dryden.*

Lofty trees, with sacred shades,
And *perspectives* of pleasant glades,
Where nymphs of brightest form appear. *Id.*

Medals have represented their buildings according to the rules of *perspective*. *Addison on Medals.*

Faith for reason's glimmering light shall give
Her immortal *perspective*. *Prior.*

How richly were my noon-tide trances hung
With gorgeous tapestries of pictured joys!
Joy behind joy, in endless *perspective!* *Young.*

PERSPECTIVE is a branch of the science of optics which teaches how to represent the objects of vision on a plane surface.

Vitruvius says that the first who wrote a treatise on this subject was Agathareus, a disciple of Æschylus, and that subsequently his principles were elucidated and improved by Democritus and Anaxagoras. None of these treatises of the ancients, however, have come down to modern times. It is to the revival of painting in Italy that we must trace the existing art; and it seems to have owed its reviviscence particularly to that branch of painting which was employed in the decorations of the theatres.

The Arabian optician Alhazen, who flourished about the year 1100. should not be omitted, however, in our catalogue of writers. Roger Bacon cites his work, and treats himself on the subject with creditable accuracy.

The earliest writer whose rules of perspective survive is Peter del Borgo, an Italian, who died in 1443. He supposed objects to be placed beyond a transparent tablet, and endeavoured to trace the images which rays of light, emitted from them, would make upon it. What success he had in this attempt we know not, as his book on this subject has perished. It is, however, very much commended by the famous Ignatius Dante; and, upon the principles of Borgo, Albert Durer constructed a machine, by which he could trace the perspective appearance of objects. Balthazar Perussi studied the writings of Borgo, and endeavoured to make them more intelligible. To him we owe the discovery of points of distance, to which all lines that make an angle of 45° with the ground line are drawn.

Not long after, another Italian, Guido Ulbaldi, observed that all the lines that are parallel to one another, if they be inclined to the ground line, converge to some point in the horizontal line, and that through this point also a line drawn from the eye, parallel to them, will pass. These principles put together enabled him to make out a pretty complete theory of perspective.

His work was published at Pesaro in 1600, and may be said to have contained the fundamental principles of the system of Gravesande and Dr. Brook Taylor; the outline, in fact, of the only system worth the student's attention. For, while this is a science of the first importance to a painter, he is not, at the same time, to be too strictly confined to its rules. Nothing, indeed, should be permitted to tie up his hands or cramp his genius; on the contrary, he should be left fully at liberty to express his idea with one stroke of his pencil; and, as Fresnoy advises, 'let the compasses be rather in his eyes than in his hands;' in that way let him measure distinctly every object by comparison—the principal talent which he should own. If he is well acquainted with the principles of his art, he will not stop at the dry rules of geometry, while his fancy is sketching all the chief parts of his picture; but proceed with the whole, and, when the design is arranged, then correct all those portions which require it by the laws of perspective.

But while, on the one hand, we are anxious to guard the student against dwelling too much on the more mechanical parts of his interesting art, we must, on the other, strive to impress on his mind that a thorough knowledge and an undeviating attention to this important branch of it is not only eligible but indispensable. The study of it should, indeed, go hand in hand with that of anatomy, as not less fundamental and necessary.

The contour of an object drawn upon paper or canvas represents nothing more than such an intersection of the visual rays sent from the extremities of it to the eye as would arise on a glass put in the place of the paper or canvas. Now, the situation of an object at the other side of a glass being given, the delineation of it in the glass itself depends entirely on the situation of the eye on this side of the glass; in other words, on the rules of perspective.

To understand these, suppose a person at a window looks through an upright pane of glass at any object beyond it, and keeping his head steady, draws the figure of the object upon the glass with a black lead pencil, as if the point of the pencil touched the object itself; he would then have a true representation of the object in perspective as it appears to his eye.

To do this, let the glass be laid over with strong gum water, which, when dry, will be fit for drawing upon, and will retain the traces of the pencil; and then let the student look through a small hole in a thin plate of metal, fixed about a foot from the glass, between it and his eye, and keep his eye close to the hole; otherwise he might shift the position of his head, and consequently make a false delineation of the object.

After tracing out the figure of the object, he may go over it again with pen and ink; and, when that is dry, put a sheet of paper upon it, and trace it thereon with a pencil; then taking away the paper and laying it on a table, he may finish the picture by giving it the colors, lights, and shades, as he sees them in the object, of which he will now have a true resemblance.

To such as have a general knowledge of the principles of optics, this must be self-evident: for as vision is occasioned by pencils of rays coming in straight lines to the eye from every point of the visible object, it is plain that, by joining the points in the transparent plane, through which all those pencils respectively pass, an exact representation must be formed of the object as it appears to the eye in that particular position, and at that determined distance; and could pictures of things be always first drawn on transparent planes, this simple operation, with the principle on which it is founded, would comprise the whole theory and practice of perspective. As this, however, is far from being the case, rules must be deduced from the sciences of optics and geometry for drawing representations of visible objects on opaque planes; and the application of these rules constitutes what is properly called the art of perspective.

Before we lay down the further principles of this art, it is proper to observe, that when a person stands directly opposite to the middle of one end of a long avenue, which is straight and equally broad throughout, the sides thereof seem to approach nearer to each other in proportion as they are farther from his eye; or the angles, under which their different parts are seen become gradually less, according as the distance from his eye increases; and, if the avenue be very long, the sides of it at the farthest end seem to meet: and there an object that would cover the whole breadth of the avenue, and be of a height equal to that breadth, would appear only to be a mere point.

Having made these preliminary observations, we now proceed to

SECT. I.—DEFINITIONS OF THE TERMS USED IN PERSPECTIVE.

1. The *horizontal line* is that line supposed to be drawn parallel to the horizon through the eye

of the spectator; or rather, it is a line which separates the heaven from the earth, and which limits the sight. Thus A and B, plate PERSPECTIVE, fig. 1, are two pillars below the horizontal line C D, because the eye is elevated above them; in fig. 2 they are said to be equal with it; and in fig. 3 raised above it. Thus, according to the different points of view, the objects will be either higher or lower than the horizontal line.

2. The *point of sight* A, fig. 4, is that which makes the centrical ray on the horizontal line *a b*; or it is the point where all the other visual rays D, D, unite.

3. The *points of distance* C, C, fig. 4, are points set off in the horizontal line at equal distances on each side of the point of sight A.

4. And in the same figure B B represents the *base line* or *fundamental line*.

5. E E is the *abridgment* of the square, of which D, D, are the *sides*.

6. F, F, the *diagonal lines* which go to the points of distance C, C.

7. *Accidental points* are those where the objects end; these may be cast negligently, because neither drawn to the point of sight, nor to those of distance, but meeting each other in the horizontal line. For example, two pieces of square timber, G and H, fig. 5, make the points I, I, I, I, on the horizontal line; but go neither to the point of sight K, nor to the points of distance C, C; these accidental points serve likewise for casements, doors, windows, tables, chairs, &c.

8. The *point of direct view*, or *of the front*, is when we have the object directly before us; in which case it shows only the fore side; and, if below the horizon, a little of the top; but nothing of the sides, unless the object be polygonous.

9. The *point of oblique view* is when we see an object aside of us and as it were aslant, or with the corner of our eye; the eye, however, being all the while opposite to the point of sight; in which case we see the object laterally, and it presents to us two sides or faces. The practice is the same in the side points as in the front points; a point of sight, points of distance, &c., being laid down in the one as well as in the other.

10. *Projection* delineates objects *in plano* by means of right lines called rays, supposed to be drawn from every angle of the subject, to particular points. When the objects are angular, these rays necessarily form pyramids, having the plane or superficies whence they proceed for their basis; but, when drawn from or to circular objects, they form a cone.

11. *Ichnography*, or ichnographic projection, is described by right lines parallel among themselves and perpendicular to the horizon from every angle of every object, on a plane parallel to the horizon: the points where the perpendicular lines or rays cut that plane being joined by right lines. The figure projected on the horizontal plane is likewise called the plan or seat of that object on the ground plane. The points are the sites, or seats, of the angles of the object. The lines are the seats of the sides. By this we are to understand how the basis of figures represented as superstructures stand or are supported; and we are further enabled to judge of, indeed to measure, their several parts and their areas.

12. *Orthography* represents the vertical position and appearance of an object; and hence orthographic projection is called the *elevation*. When we see the front of a house represented, we give it that term; when the side, we denominate it the *profile*. If we suppose a house, or other object, to be divided by a plane passing perpendicularly through it in a line at right angles with the point, we call it the lateral section; but, if the plane pass in a direction parallel with the front, it is termed a longitudinal section. If the plane passes in neither of the former directions (not however deviating from the vertical), it is said to be an oblique section.

13. These afford us the means of laying down plans, of showing the parts and the manner in which the interiors of edifices are arranged, consequently are indispensable to the architect or surveyor, and indeed should be understood by every individual connected any way with designing or building. Nor should the following be neglected;—namely, *scenography*, which shows us how to direct the visual rays to every point or part of a picture; and *stereography*, which enables us to represent solids on a plane, from geometrical projection; whence their several dimensions, viz. length, breadth, and thickness, may all be represented, and correctly understood at sight.

14. An *original object* is that which becomes the subject of the picture, and is the parent of the design.

15. *Original planes* or *lines* are the surfaces of the objects to be drawn; or they are any lines of those surfaces; or they are the surfaces on which those objects stand.

16. *Perspective plane* is the picture itself, which is supposed to be a transparent plane, through which we view the objects represented thereon.

17. *Vanishing planes* are those points which are marked upon the picture by supposing lines to be drawn from the spectator's eye parallel to any original lines, and produced until they touch the picture.

18. *Ground plane* is the surface of the earth, or plane of the horizon, on which the picture is imagined to stand.

19. The *ground line* is that formed by the intersection of the picture in the ground plane.

20. *Vanishing points* are the points marked down in the picture by supposing lines to be drawn from the spectator's eye parallel to any original lines, and produced until they touch the picture.

21. The *centre* of a picture is that point on the perspective plane where a line drawn from the eye perpendicular to the picture would cut it; consequently it is that part of the picture which is nearest to the eye of the spectator.

22. The *distance* of the picture is that from the eye to the centre of the picture. The distance of a vanishing point is the distance from the eye of the spectator to that point where the converging lines meet, and, after gradually diminishing all the objects which come within their direction and proportion, are reduced so as, in fact, to terminate in nothing. All parallel lines have the same vanishing points; that is to say, all such as are, in building, parallel to each other,

when not represented precisely opposite to, and parallel with, the eye, will appear to converge towards some remote point, i. e. their vanishing point. Circles, when retiring in such manner, are represented by ellipses, proportioned to their distances: their dimensions in perspective are ascertained by enclosing them, or the nearest of them, where a regular succession is to be portrayed, within a square, which, being divided into any number of equal parts or chequers, will exhibit all the proportions of those more remote.

23. A *bird's eye view* is supposed to be taken from some elevated spot which commands a prospect nearly resembling the plane or ichnography of the places seen. Thus the view from a high tower, or from a mountain, whence the altitudes of the various objects on the plane below appear much diminished, gives nearly the same representation as is offered to a bird flying over them—and hence the term. Some idea of this may be obtained by standing on any height, and observing how low those objects which are near thereto will appear when compared with those more distant; taking however the perspective diminution of the latter into consideration.

When a painter has formed a scene in his mind, and supposed, as is customary, that the principal figures of this scene lie close, or almost close, to the back of his canvas, he is, in the next place, to fix on some point on this side of the canvas from which he would choose his piece should be seen. But in choosing this point, which is called the *point of sight*, regard should be had to its situation to the right or left of the middle of the canvas; but, above all things, to its distance and height with respect to the lower edge of the canvas; which edge is called the *base line*, and is parallel with the horizontal line which passes through the eye. For by assuming the point of sight, and consequently the horizontal line, too low, the planes upon which the figures stand will appear a great deal too shallow; as, by assuming it too high, they will appear too steep, so as to render the piece far less light and airy than it ought to be. In like manner, if the point of sight is taken at too great a distance from the canvas, the figures will not admit of degradation enough to be seen with sufficient distinctness: and, if taken too near it, the degradation will be too quick and precipitate to have an agreeable effect. Thus, then, it is evident that no small attention is requisite in the choice of this point.

When a picture is to be placed on high, the point of sight should be assumed low, and vice versâ: in order that the horizontal line of the picture may be, as near as possible, in the same horizontal plane with that of the spectator; for this disposition has a surprising effect. When a picture is to be placed very high, as, amongst many others, that of the Purification, by Paolo Veronese, it will be proper to assume the point of sight so low that it may lie quite under the picture, no part of whose ground is in that case to be visible; for, were the point of sight to be taken above the picture, the horizontal ground of it would appear sloping to the eye, and both figures and buildings as ready to tumble headforemost It is true, indeed, that there is seldom a necessity for such extraordinary exactness; and that, unless in some particular cases, the point of sight had better be high rather than low: as a reason for which we may observe that, as we are more accustomed to behold people on the same plane with ourselves than either higher or lower, the figures of a piece must strike us most when standing on a plane nearly level with that on which we ourselves stand. To this it may be added that by placing the eye low, and greatly shortening the plane, the heels of the back figures will seem to bear against the heads of the foremost, so as to render the distance between them far less perceptible than it would otherwise be. The point of sight being fixed, according to the situation in which the picture is to be placed, the *point of distance* is next to be determined. In doing this a painter should carefully attend to three things:—first, that the spectator may be able to take in, at one glance, the whole and every part of the composition; secondly, that he may see it distinctly; and, thirdly, that the degradation of the figures and other objects of the picture be sufficiently sensible.

Sect. II.—General Rules.

1. Let every line which in the object or geometrical figure is straight, perpendicular, or parallel to its base, be so also in its scenographic delineations, or in the description, in all its dimensions, such as it appears to the eye; and let the lines which in the object return at right angles from the fore right side, be drawn in like manner scenographically from the point of sight.

2. Let all straight lines which in the object return from the fore right side, run in a scenographic figure, into the horizontal line.

3. Let the object you intend to delineate, standing on the right hand, be placed also on the right hand of the point of sight; that on the left hand, on that hand of the same point; and that which is just before, in the middle of it.

4. Let those lines which, in the object, are equidistant from the returning line, be drawn in the scenographic figure from that point found in the horizon.

5. In setting off the altitude of columns, pedestals, &c., measure the height from the base line upward in the front or fore right side; and a visual ray down that point in the front shall limit the altitude of the column, or pillar, all the way behind the front side, or orthographic appearance, even to the point of sight. This rule must be observed in all figures, as well where there is a front, or fore right side, as where there is none.

6. In delineating ovals, circles, arches, crosses, spirals, and cross arches, or any other figure in the roof of a room, first draw ichnographically, and so, with perpendiculars from the principal points thereof, carry it up to the ceiling, from which several points carry on the figure.

7. The centre in any scenographic regular figure is found by drawing cross lines from the opposite angles; for the point where the diagonals cross is the centre.

8. A ground plane of squares is alike, both above and below the horizontal line; only the

more it is distant either above or below the horizon, the squares will be so much the larger or wider.

9. In drawing a perspective figure where many lines come together, to direct your eye, draw the diagonals in red, the visual lines in black, the perpendiculars in green, or any other color different from that which you intend the figure shall be.

10. Having considered the height, distance, and position of the figure, and drawn it accordingly, with its side or angle against the base, raise perpendiculars from the several angles or designed points, from the figure to the base, and transfer the length of each perpendicular, from the place where it touches the base, to the base on the side opposite to the point of distance. Thus the diametrals to the perpendiculars in the base, by intersection with the diagonals drawn to the several transferred distances, will give the angles of the figures; and so lines drawn from one point to another will circumscribe the scenographic figure.

11. If in a landscape there be any standing waters, as rivers, ponds, &c., place the horizontal line level with the farthest sight or appearance of it.

12. If there be houses, churches, castles, towers, mountains, ruins, &c., in the landscape, consider their position, that you may find from what point in the horizontal lines to draw the front and sides of them in the picture.

13. In drawing objects at a great distance, observe the proportions, both in magnitude and distance, in the draught, which appear from the object to the eye.

14. In coloring and shadowing near objects, you must make the same colors and shades in your picture which you observe with your eye in the landscape; but, according as the distance becomes greater, the colors must be fainter, till at last they are gradually lost in a darkish sky-color.

Sect. III.—Mechanical Illustrations of Drawing in Perspective.

1. Suppose L L D B A, fig. 6, plate Perspective, a square piece of pavement, consisting of twenty-five pieces of marble, each a foot square: it must be measured exactly, and laid regularly down upon paper; and for the sake of a more distinct notion how every particular square will appear when you have a true perspective view of them, mark every other stone or marble black; or else number each of them as in the figure, which is divided into squares, every other one of which may be made to appear black, like the three at the bottom marked B C D: or 1, 2, 3, 4, answering to those which are marked in the perspective with the same numbers. To lay your plan in perspective, fix your point of sight as you observe in the figure; or more or less to the right or left; then draw the line K K parallel to, and at what distance you will from L L; and raise a line on each side from L to K, to form the figure you see, as a frame; then draw a line from the corner K, which is the point of distance, to the opposite corner L; and this line will regulate your work. Now draw lines from the squares of your plan to the point of sight, as exact as possible; and, wherever your line of distance cuts those lines, draw lines parallel to the line L L, which will give you the squares in perspective, or the true figure of every square. Thus D, in the perspective plan, answers to B in the measured plan, and 1, 2, 3, and 4, answer to their corresponding squares in the same plan.

To raise either pillars, trees, houses, or any other bodies, according to their respective heights, at different distances and proportions, on the plan laid down, measure them out in perspective into squares of a foot or any other measure. Let one of these squares, 1, 4, in fig. 7, serve for the base of a pillar a foot thick. Mark the line L K, by the scale of the ground plan, into equal proportions or feet; *a*, *b*, *c*, *d*; which being so many feet high, and standing on the base, are uprights, not in perspective. Then draw a line, 4 5, parallel to 1 *c*. Join *c* and 5, and then you have the front of a body three feet high and one foot wide, which is the object you were to raise. From 4 draw a line with a black lead pencil, to the point of sight; and from 3 raise a line parallel to 4 5, till it touches the pencilled line passing from 5 to the point of sight, which will give you the side appearance of the column or body, as you will see it from the place where you stand.

Then, with a pencil, from *c* draw a line to the point of sight, which will determine the line 6 7 that bounds the perspective view of the column a-top. Afterwards from 2 raise a pencilled line parallel to *a c* or 1 *c*, till it touches the line drawn from *c* to the point of sight; then draw 6 7 parallel to *c* 5, and you will have the square of the top of the column as observed from A, which is supposed to be the place where you stand. It is to be observed that the line drawn from 2 to 6 is only imaginary, and in consequence is to be rubbed out, because, not being seen from the place where you stand, it must not appear in the drawing. The same may be understood of the line drawn from 1 to 2; but it is necessary that they appear in the draught, as they direct you how to regulate the top of your column, and to place it with certainty upon its base.

Lastly, finish your column with lines only, that is, from 1 to *c*, from 4 to 3, from 3 to 7, from *c* to 5, from 6 to 7, and from 1 to 4, whereby you will have the true representation of the column, as in fig. 8.

When this is done, you may erect other columns on the other squares in the same manner, observing to fling your shades all on one side, and being master of these few examples, which will cost very little trouble, you will find the principle of them apply to various objects.

For the construction of a camera obscura, 1. Darken the room E F, fig. 10, leaving only an aperture open in the window at V, on the side I K, facing the prospect A B C D. 2. In this aperture fit a lens, either plano-convex, or convex on both sides. 3. At a due distance, to be determined by experience, spread a paper or white cloth, unless there be a white wall; then on this, G H, the desired objects A B C D will be delineated invertedly. 4. If you would have them appear erect, place a concave lens between the centre and the focus of the first lens, or receive the image on a plane speculum inclined to the horizon under an angle of 45°, or have two lenses included in a draw-tube instead of one. If the aperture do not exceed the bigness of a pea, the objects will be represented without any lens at all. And thus the objects may be drawn or copied to the greatest degree of accuracy. The student will adopt any of these methods which he finds will be most suitable to his purpose; but the camera obscura is that which is most generally used by painters. This method has also the additional advantage of giving the student a correct idea of coloring from nature.

Sect. IV.—Rules and Examples in Scenographic Perspective, &c.

1. Suppose the pentagon A B D E F, fig. 1, plate II., required to be represented by the rules of perspective on the transparent plane V P, placed perpendicularly on the horizontal plane H R, dotted lines are imagined to pass from the eye C to each point of the pentagon C A, C B, C D, &c., which are supposed, in their passage through the plane P V, to leave their traces or vestiges in the points *a*, *b*, *d*, &c., on the plane, and thereby to delineate the pentagon *a b d e f*; which, as it strikes the eye by the same rays that the original pentagon A B D E F does, will be a true perspective representation of it.

2. To find the perspective appearance of a triangle, H B C, fig. 2, between the eye and the triangle, draw the line D E, which is called the fundamental line; from 2 draw 2 V, representing the perpendicular distance of the eye above the fundamental line, be it what it will; and through V draw, at right angles to 2 V, H K parallel to D E; then will the plane D H K E represent the transparent plane, on which the perspective representation is to be made. Next, to find the perspective points of the angles of the triangle, let fall perpendiculars A 1, C 2, B 3, from the angles to the fundamental D E; set off these perpendiculars upon the fundamental, opposite to the point of distance K, to B, A, C. From 1, 2, 3, draw lines to the principal point V; and from the points A, B, and C, in the fundamental line, draw the right lines A K, B K, C K to the point of distance K; which is so called, because the spectator ought to be so far removed from the figure or painting, as it is distant from the principal point V. The points *a*, *b*, and *c*, where the visual lines V 1, V 2, V 3, intersect the lines of distance A K, B K, C K, will be angular points of the triangle *a b c*, the true representation of A B C. By proceeding in this manner with the angular points of any right-lined figure, whether regular or irregular, it will be very easy to represent it in perspective.

3. If the scenographic appearance of any solid were to be represented, suppose of a triangular prism, the base of which is the triangle *m n o*, fig. 3, you need only find the upper surface of it, in the same manner as you found the lower, or base; and then, joining the corresponding points by right lines, you will have the true representation of the solid in perspective. So that the work is the same as before; only you take a new fundamental line, as much higher than the former as is the altitude of that solid the scenographic representation of which you would delineate.

4. There is still a more commodious way, which is this: having found, as above, the base or ichnographic plate *m n o*, let perpendiculars be erected to the fundamental line from the three angular points, which will express the altitudes of those points. But because these altitudes, though equal in the body or solid itself, will appear unequal in the scenographic view, the farthest off appearing less than those nearer the eye, their true proportional heights may be thus determined. Any where in the fundamental line, let A B be erected perpendicularly, and equal to the true altitude; or, if the figure have different altitudes, let them be transferred into the perpendicular A B; and from the points A and B, and from all the points of intermediate altitudes, if there be any such, draw right lines to the point of sight V: those lines A V, B V, will constitute a triangle with A B, within which all the points of altitude will be contained. Through the points *o n m*, draw parallels to the fundamental line; and from the points *a*, *a*, &c., erect perpendiculars to those parallels; and the points where they intersect the lines A V, B V, as in *a a*, *b b*, &c., will determine the apparent height of the solid in the scenographic position to the eye in V. In practice, these parallels and perpendiculars are easily drawn, by means of a good drawing board, or table, fitted for the purpose.

5. To exhibit the perspective of a pavement, consisting of square stones, viewed directly: divide the side A B, fig. 4, transferred to the fundamental line D E, into as many equal parts as there are square stones in one row. From the several points of division draw right lines to the principal point V, and from A to the point of distance K draw a right line A K, and from B to the other point of distance L draw another L B. Through the points of the intersections of the corresponding lines draw right lines on each side, to be produced to the right lines A V and B V. Then will *a f g b* be the appearance of the pavement A F G B.

6. To show the perspective appearance of a square A B D C, fig. 5, seen obliquely, and having one of its sides A B in the fundamental line. The square being viewed obliquely, assume the principal point V, in the horizontal line H R, in such a manner, as that a perpendicular to the fundamental line may fall without the side of the square A B, or at least may not bisect it; and make V K the distance of the eye. Transfer the perpendiculars A C and B D to the fundamental line D E; and draw the right lines K B, K D; as also A V and V C: then will A and B be their own appearances, and *c* and *d* the appearances of the points C and D: consequently A *c d* B is the appearance of the square A B D C.

7. If the square A C B D be at a distance from the fundamental line D E, which rarely happens in practice, the distances of the angles A and B must likewise be transferred to the fundamental line; and even the oblique view itself is not very common. The reason why objects appear smaller as they are at a greater distance, is, that they appear according to the angle of the eye, wherein they are seen; and this angle is taken at the eye, where the lines terminating the objects meet.

8. For example, the eye A, fig. 6, viewing the object BC, will draw the rays AB and AC, which give the angle BAC; so that an object viewed under a greater angle will appear larger, and another under a less angle smaller. That, among equal objects, those at the greatest distance appear smallest, and consequently, that in all perspective the remotest objects must be made the smallest, will be manifest from the figure: the objects BC, DE, FG, HI, and KL, being all equal, but at different distances from the eye, it is evident that the angle DAE is less than the angle BAC, that FAG is less than DAE, that HAI is less than FAG, and that KAL is less than HAI. Hence, the second, third, fourth, and fifth objects will appear smaller, though really all equal, inasmuch as the angles diminish in proportion as the objects recede. If the eye, on the other hand, were removed to M, KL would appear the largest, and BC no bigger than NO.

9. It follows that, as objects appear such as is the angle they are seen under, if several lines be drawn between the sides of the same triangle, they will all appear equal: thus all the lines comprised between the sides ON and OP, fig. 7, of the triangle NOP, will appear equal to each other: and, as objects comprehended under the same angle seem equal, so all comprehended under a greater angle must seem greater, and all under a smaller angle less.

10. This being premised, if there be a number of columns or pilasters to be ranged in perspective on each side of a hall, church, or the like, they must of necessity be all made under the same angle, and all tend to one common point in the horizon O, fig. 8. For instance, if from the points D, E, the eye being placed at A, and viewing the first object DE, you draw the visual rays DO and EO, they will make the triangle DOE, which will include the columns DE, FG, HI, KL, MN, so as they will all appear equal.

11. What has been said of the sides is likewise to be understood of the ceilings and pavements; the diminutions of the angles of remote objects, placed either above or below, following the same rule as those placed laterally. Trees, being ranged by the same law, have the same effect as the columns, &c.; for being all comprehended in the same angle, and the two rays having each its own angle, and all the angles meeting in a point, they form a third, which is the earth, and a fourth, which may be supposed the air, and thus afford an elegant prospect.

12. To exhibit the perspective of a circle, if it be small, circumscribe a square about it: draw diagonals and diameters *ha* and *de*, fig. 9, intersecting each other at right angles; and draw the right lines *fg* and *bc* parallel to the diameter *de* through *b* and *f*; as also through *f* and *g* draw right lines meeting the fundamental line in the points 3 and 4. To the principal point V draw right lines V 1, V 3, V 4, V 2; and to the points of distance L and K draw the right lines L 2 and K 1. Lastly, connect the points of intersection, *a. b, d, f, h, g, e, c,* with the arches *ab, bd, df,* &c. Thus will *a b d f h g c c* be the appearance of the circle.

13. If the circle be large, on the middle of the fundamental AB, fig. 10, describe a semicircle, and from the several points of the periphery C, F, G, H, I, &c., to the fundamental line, let fall perpendiculars C 1, F 2, G 3, H 4, I 5, &c. From the points A, 1, 2, 3, 4, 5, &c., draw right lines to the principal point V; as also a right line from B to the point of distance L, and another from A to the point of distance K. Through the common intersection draw right lines, as in the preceding case: thus we shall have the points *e, f, g, h, c,* which are the representations of these, A, C, F, G, H, I, which being connected as before give the projection of the circle. Hence it appears not only how any curvilinear figure may be projected on a plane, but also how any pavement consisting of any kind of stones may be delineated in perspective. If any complicated figure be proposed, it may not be easy to apply the practical rules to the description of every minute part; but by enclosing that figure in a regular one properly subdivided, and reduced into perspective, a person skilled in drawing may with ease describe the object proposed.

Upon the whole, where the boundaries of the proposed object consist of straight lines and plain surfaces, they may be described directly by the rules of perspective: but when they are curvilinear, either in their sides or surfaces, the practical rules can only serve for the description of such right-lined cases as may conveniently enclose the objects, and which will enable the student to draw them within those known bounds with a sufficient degree of exactness. It would indeed be a fruitless task, to seek, by the practical rules of perspective, to describe all the little hollows and prominences of objects; the different lights and shades of their parts, or their smaller windings and turnings; the infinite variety of the folds in drapery; of the boughs and leaves of trees; or the features and limbs of men and animals; much less to give them that roundness and softness, that force and spirit, that eagerness and freedom of posture, that expression and grace, which are requisite to a good picture.

It may appear a bold assertion to say that the very short sketch now given of the art of perspective is a sufficient foundation of the whole practice, and includes all the rules peculiar to the problems which most generally occur. But, the scientific foundation being simple, the structure need not be complex, nor swell into such volumes as have been published on the subject: volumes which, by their size, deter from the perusal, and give this simple art the appearance of mystery. Thus narrowing instead of enlarging the knowledge of the art; until the student, tired of the bulk of the volume, in which a single maxim is tediously spread out, and the principle on which it is founded kept out of sight, contents himself with a remembrance of the maxim, and rarely ascends to first principles.

We subjoin, however, for the information of those who would wish farther to pursue the subject an ample list of approved authors.

In the Latin language we find:—Johannis Cantuariensis, Perspectiva, Pisa, 1508, folio; an Italian translation of which, with notes was published, by Galucci, at Venice, 1593, folio. C. Vittellionis, De Natura, Ratione, et Projectione Radiorum Visus, Luminum, Colorum, atque Formarum, quam vulgo Perspectivam vocant, libri x. Norimb. 1551, folio, with plates. Joa. Fr. Niceroni, Tavmaturgus Opticus Studiosissimus Perspectivæ, Paris, 1638, folio; a French translation of this appeared also at Paris, under the title of Perspective Curieusé, 1663, folio. Guido Ubaldus, Perspectiva, 1600, folio. Perspectiva Horaria, Auct. Em. Maignan, Rome, 1648. Andrea Putel, surnamed Porzi, Perspectiva Pictorum et Architectorum (Latin and Italian), Rome, 1693—1700, 2 vols. folio, with 226 engravings. This very useful work has also appeared in Latin and German, translated into the latter by J. Boxbath and G. C. Bodenner, Augsburgh, 1706—1709, folio. Strutt published likewise an edition in Latin and English, London, 1693—1707, folio. Bernard Lamy's book appeared in 1701, in 8vo.; and the ingenious work of S'Gravesande, in 1711, in 8vo., translated into English by Stone in 1724. Ram. Rampinelli, Lectiones Opticæ, Brix. 1760, 4to., with thirty-two plates.

In Italian:—Trattato di Prospettiva di Bern. Zenale da Trevigi, Milan, 1524, folio. Prattica della Prospettiva, di M. Dan Barbaro, Venice, 1559, 1568, 1669, folio, with plates—a very serviceable publication. Dispareri in materia d' Architettura e di Prospettiva, Bresc. 1572, 4to. Le Due Regole della Prospettiva prattica, di Giac. Barozzi di Vignola, con i Comment. del P. Egn. Danti, Rome, 1583, 1611, 1644, folio, Bol. 1682, folio, Venice, 1743, fol. La Prattica di Prospettiva, del Car. Lor. Sirigati, Venice, 1596, 1626, folio. Discorso Intorno al Disegno con gl' Inganni del Occhio, Prospett. Prat. di P. Accolti, Firenza, 1625, folio. Prospettiva Prattica, di Bern. Contino, Venice, 1645, 1684. folio. Paradossi per Praticar la Prospettiva, Senza Saperla, da Giul. Troili, Bol. 1672, 1683, folio. Nuova Prattica di Prospettiva, da Paolo Amato, Pal. 1736, folio. Trattato Teoretico Prattico di Prospettiva, di Eust. Zanotti, Bol. 1766, 4to. with engravings. Della Geometrie e Prospettiva Prattica, di Bald. Orsini, Rome, 1774, 3 vols. 12mo.

In Dutch:—Het Perspectiv Conste van John Friess Vredemann, London, 1559, folio, Amst. 1633, 2 vols. folio. Marolois has given a French translation of this work, entitled La Perspective, Contenant tant la Théorie que la Pratique, Amst. 1662, folio. Onderwysinge in der Perspectiv Conste, door Henr. Hondius, La Hague, 1622, 1647, folio, of which a Latin translation was published at the same place, 1647, folio.

In French:—Livre de Perspective, par J. Cousin, Paris, 1560, folio, 1587, 4to. Leçons de Perspective, par Jaques André du Cerceau, Paris, 1576, folio. La Perspective avec la Raison des Ombres et des Miroirs, par Sal. De Caux, London, 1612, folio. La Perspective of Matth. Josse, in Latin and French, Paris, 1635, folio, with fifty-five plates. La Perspective Pratique Nècessaire à tous les Peintres, Graveurs, et Architectes, par un Religieux de la Comp. de Jésus, Paris, 1642, 4to., 1663, 4to., and 1679, 4to. 3 vols.—There have appeared two English translations of this, one by Prike, 1672, 4to.—the other by Chambers, 1726, folio; and a German translation by J. C. Rembold, Augs. 1710, 4to. Manière Universelle de Gérard Desargues, pour pratiquer la Perspective par petit-pied comme géométral; ensemble les Places et Proportions des fortes et foibles Touches, Teintes, ou Couleurs, par Abr. Bosse, 1648, 2 vols. with 202 engravings. This is one of the most extensive and at the same time important of the works on perspective. It occasioned a great many other writings on the same subject, a detail of which will be found in Lettres écrites au Sieur Bosse, 8vo. The same Abraham Bosse has also given a work entitled Traité des Pratiques Géométrales et Perspectives, Paris, 1665, 12mo. with seventy engravings. Optique de Portraiture et de Peinture, par François Huret, Paris, 1675, folio. Traité de la Perspective où sont contenus les Fondemens de la Peinture, par le P. Bern. Lami, Paris, 1701, 12mo. Amst. 1734, 8vo. An English translation appeared at London in 1702, 12mo. Perspective Pratique d'Architecture, par L. Bretetz, Paris, 1706, 1746, 1752, folio. Traité de la Perspective Pratique, avec des Remarques sur l'Architecture, par le S. Courtonne, Paris, 1710, 1725, folio. Perspective Théorique et Pratique, par M. Ozanam, Paris, 1711, 8vo. Traité de la Perspective à l'usage des Artistes, par E. S. Jeaurat, Paris, 1750, 4to, with 110 engravings. Essai sur la Perspective Pratique, par Le Roy, Paris, 1757, 12mo. Raisonnement sur la Perspective pour en faciliter l'usage aux Artistes, par M. Petitot, Parma, 1758, folio, in French and Italian. Essai sur la Perspective Linéaire et sur les Ombres, par le Chevalier de Curel, Strasb. 1766, 8vo. Traité de Perspective Linéaire, par S. N. Michel, Paris, 1771, 8vo. La Perspective Aérienne Soumise à des Principes puisés dans la Nature, ou Nouveau Traité du Clair-obscur et de Chromatique, à l'usage des Artistes, par M. de St. Morien, Paris, 1789, 8vo. Elémens de Perspective Pratique, à l'usage des Artistes, par Valenciennes, Paris, 4to. Lavit, Perspective Linéaire.

In English:—Practical Perspective made Easy, by Mason, 1670, folio. Architectural Perspective, by Peake, folio. Perspective made Easy, by W. Halfpenny, 1731, 4to. Stereography, or a complete Body of Perspective, in all its Branches, by J. Hamilton, London, 1738. 1749, folio, with 130 engravings. Humphry Ditton's book, 1712, folio. Two Treatises, by Brook Taylor, one in 1715, the other in 1719. Oakley's Magazine of Architecture, Perspective, and Sculpture, 1730, folio. Perspective made Easy in Theory and Practice, by J. Kirby, London, 1755, 1768, 4to. Perspective of Architecture, deduced from the principles of Brook Taylor, and performed by two rules only of universal application, by the same, London, 1755, 1761, 2 vols. folio. The art of Drawing in Perspective made Easy to those who have no previous Knowledge of Mathematics, by J. Ferguson, London, 1755, 1778, 8vo. Practice of Perspective, by J. Highmore, 1784, 4to. Theory of Perspective in a Method Entirely New, by

J. L. Cowley, London, 1766, 2 vols. 4to. Familiar Introduction to the Theory and Practice of Perspective, by J. Priestley, London, 1770, 8vo. The Elements of Linear Perspective demonstrated by Geometrical Principles, by Edward Noble, London, 1771, 8vo. A Complete Treatise on Perspective, in Theory and Practice, on the Principles of Dr. Brook Taylor, by T. Malton, London, 1776, folio. Ware's Complete Body of Architecture contains a Treatise on Perspective, 1760, folio. A Practical Treatise of Perspective on the Principles of Dr. Brook Taylor, by Edward Edwards, second edition, 1806. A thin 4to., without the author's name, entitled A New Treatise on Perspective, Founded on the Simplest Principles, containing Universal Rules for Drawing the Representation of any Object on a Vertical Plane, 1810. The work of D. Cresswell, A.M, 1811, 8vo. Milne, in his Elements of Architecture, 1812, 4to., and Mr. Hayter's work, 1813, 8vo. Martin, Muller, and Emerson, have also given treatises in their mathematical courses.

Works on this subject, under the following denominations, have appeared in the German language:—Of Perspective, as it regards the Arts, 1509, folio, with thirty-seven wood-cuts. Gualt. Henr. Rivius, New Perspective, or The True Foundation of the Arts of Design, Nuremberg, 1547, folio. John Lautensak, Instructions on the Use of the Compass and Rule, particularly in Perspective, Franckf. 1567, folio. Perspectivum Corporum Regularium, &c., par Jamitzer, Nuremberg, 1564, folio. Lud Bruns. Practice of Perspective, &c., Leipsic, 1615, folio, Lenkart, Treatise on Perspective, Augs. 1616, folio. Alberti on Perspective and Shading, Nürnb. 1623-7, folio. Schubler, Instructions on Perspective, &c., Nürnb. 1719-20, 2 vols. folio, with fifty engravings. Lucidum Prospectivæ Speculum, by P. Heinecken, Augs. 1727, folio, with ninety-three engravings. Ibid. 1753, folio, with 126 engravings. Summary Instructions on Perspective, by John Christopher Bischof, Halle, 1741, 8vo. Instructions on the manner of tracing all Elevations in Perspective, without having regard to a plan, by J. H. Lambert, Zurich, 1759, 8vo., and 1774, 8vo. A French translation appeared in 1759, 8vo. Manner of learning to draw by means of Geometry and Perspective, by Werner, Erfort, 1764, 8vo. Detailed Instructions on Perspective, after an easy and clear method, by C. Phil. Jacobz, Amst. 1767, 8vo., with sixty plates. Treatise on Perspective, by Luc. Voch, Augs. 1780, 8vo. Elements of Perspective for the use of Painters, by Burja, Berlin, 1793, 8vo.

The reader may also turn with advantage to Leçons de Perspective, par L. le Bicheur, Ludovico Cigoli, on Perspective. Perspectiva Practica, by Franc. De Breuil. The work of Albert Durer on the Proportions of the Human Body, Nürnberg, 1528, folio. The second book of the Architettura of Seb. Serlio, Paris, 1545, folio. The fifth book of Trattato dell' Arte della Pittura, of Lomazzo, Milan, 1585, 4to. Museo Pittorico, by Velasco, Madrid, 1715, folio. Remarques sur les Tableaux en jeu d'Optique, in the French Mercury for the year 1763, &c. &c.

Perspective, Aerial, is the art of giving a due diminution or degradation to the strength of the light, shade, and colors of objects, according to their different distances, the quantity of light which falls on them, and the medium through which they are seen.

As the eye does not judge of the distance of objects entirely by their apparent size, but also by their strength of color, and distinction of parts; so it is not sufficient to give an object its due apparent bulk according to the rules of stereography, unless at the same time it be expressed with that proper faintness and degradation of color which the distance requires. Thus if the figure of a man, at a distance, were painted of a proper magnitude for the place, but with too great a distinction of parts, or too strong colors, it would appear to stand forward, and seem proportionally less, so as to represent a dwarf situated nearer the eye, and out of the plane on which the painter intended it should stand. By the *original color* of an object is meant that color which it exhibits to the eye when duly exposed to it in a full open uniform light, at such a moderate distance as to be clearly and distinctly seen.

This color receives an alteration from many causes, the principal of which are the following: 1. From the object's being removed to a greater distance from the eye, whereby the rays of light which it reflects are less vivid, and the color becomes more diluted and tinged in some measure, by the faint bluish cast, or with the dimness or haziness of the body of air through which the rays pass. 2. From the greater or less degree of light with which the object is enlightened; the same original color having a different appearance in the shade, from what it has in the light, although at an equal distance from the eye, and so in proportion to the strength of the light or shade. 3. From the color of the light itself which falls upon it, whether it be from the reflection of colored light from any adjacent object, or by its passage through a colored medium, which will exhibit a color compounded of the original color of the object, and the other accidental colors which the light brings with it. 4. From the position of the surface of the object, or of its several parts with respect to the eye; such parts of it appearing more lively and distinct than those which are seen obliquely. 5. From the closeness or openness of the place where the object is situated; the light being much more variously directed and reflected within a room than in the open air. 6. Some original colors naturally reflect light in a greater proportion than others, though equally exposed to the same degrees of it; whereby their degradation at several distances will be different from that of other colors which reflect less light.

Perspective Machines, or contrivances for designing or drawing in perspective, are of various kinds. We have described the construction of the camera obscura, and shall here add only the machine suggested originally by Dr. Bevis, and another by Mr. Kirby.

The plane of the former machine is represented fig. 1, Perspective. Plate III. fig. 2 is a representation of it when made use of in drawing distant objects in perspective. *abef*, fig. 1, is an oblong square board, represented by A B E F in fig. 2; *x* and *y* (X and Y) are two hinges on which the part *cld* (C L D) is moveable. This part consists of two arches or portions of circles *c l m* (C L M) and *d n l* (D N L), joined together at the top *l* (L), and at bottom to the cross bar *dc* (D C), to which one part of of each hinge is fixed, and the other part to a flat board, half the length of the board *abef* (A B E F), and glued to its uppermost side. The centre of the arch *c m l* is at *d*, and the centre of the arch *d n l* is at *c*. On the outer side of the arch *d n l* is a sliding piece *n* (much like the nut of the quadrant of altitude belonging to a common globe), which may be moved to any part of the arch between *d* and *l*: and there is such another slider, *o*, on the arch *c m l*, which may be set to any part between *c* and *l*. A thread *c p n* (C P N) is stretched tight from the centre *c* (C) to the slider *n* (N), and such another thread is stretched from the centre *d* (D) to the slider *o* (O); the ends of the threads being fastened to these centres and sliders.

Now it is plain that, by moving these sliders on their respective arches, the intersection *p* (P) of the threads may be brought to any point of the open space within the arches. In the groove *k* (K) is a straight sliding bar *i* (I), which may be drawn farther out, or pushed farther in, at pleasure. To the outer end of this bar I, fig. 2, is fixed the upright piece H Z, in which is a groove for receiving the sliding piece Q. In this slider is a small hole *r* for the eye to look through in using the machine: and there is a long slit in H Z, to let the hole *r* be seen through when the eye is placed behind it any height of the hole above the level of the bar I.

In delineating a representation, i. e. of the house *q s r p*, a great way off, place the machine on a steady table, with the end E F of the horizontal board, A B E F, toward the house, so that when the Gothic-like arch D L C is set upright, the middle part of the open space (about P) within it may be even with the house when you place your eye on Z, and look at the house through the small hole *r*. Then fix the corners of a square piece of paper with four wafers on the surface of that half of the horizontal board which is nearest the house; and all is ready for drawing. Now set the arch upright, as in the figure; which it will be when it comes to the perpendicular side *t* of the upright piece *s t*, fixed to the horizontal board behind D. Then place your eye at Z, and look through the hole *r* at any point of the house, as *q*, and move the sliders N and O till you bring the intersection of the threads at P directly between your eye and the point *q*: then put down the arch flat upon the paper on the board, as at S T, and the intersection of the threads will be at W. Mark the point W on the paper with the dot of a black lead pencil, and set the arch upright again, as before: then look through the hole *r*, and move the sliders N and O till the intersection of the threads comes between your eye and any other point of the house, as *p*: then put down the arch again to the paper, and make a pencil mark thereon at the intersection of the threads, and draw a line from that mark to the former one at W; which line will be a true perspective representation of the corner *p q* of the house. Proceed in the same manner by bringing the intersection of the threads successively between your eye and the other points of the outlines of the house, as *r*, *s*, &c., and put down the arch to mark the points on the paper at the intersection of the threads: then connect these points by straight lines, which will be the perspective outlines of the house. In like manner find the points of the corners of the door and windows, top of the house, chimneys, &c., and draw the finishing lines from point to point: then shade the whole, making the lights and shades as you see them on the house itself, and you will have a true perspective figure of it. Great care must be taken, during the whole time, that the position of the machine be not shifted on the table; and, to prevent such an inconvenience, the table should be very strong and steady, and the machine fixed to it, either by screws or clamps.

In the same way a landscape, or any number of objects within the field of a view through the arch, may be delineated, by finding a sufficient number of perspective points on the paper, and connecting them by straight or curved lines as they appear to the eye. The arch ought to be at least a foot wide at bottom, that the eye at Z may have a large field of view through it; and the eye should then be, at least, ten inches and a half from the intersection of the threads at P when the arch is set upright. For if it be nearer the boundaries of view at the sides near the foot of the arch will subtend an angle at Z of more than sixty degrees, which will not only strain the eye, but will also cause the outermost parts of the drawing to have a disagreeable appearance. To avoid this, it will be proper to draw back the sliding bar I, till Z be fourteen inches and a half distant from P; and then the whole field of view, through the foot wide arch, will not subtend an angle to the eye at Z of more than forty-five degrees; which will give a more easy and pleasant view, not only of all the objects themselves, but also of their representations on the paper whereon they are delineated. So that, whatever the width of the arch be, the distance of the eye from it should be in this proportion: as 12 is to the width of the arch, so is 14½ to the distance of the eye (at Z) from it. If a pane of glass, laid over with gum water, be fixed into the arch, and set upright when dry, a person who looks through the hole *r* may delineate the objects upon the glass which he sees at a distance through and beyond it, and then transfer the delineation to a paper put upon the glass. Ferguson's Perspective, ch. iii.

Mr. Kirby's instrument is seen in figs. 4, 5, 6. The ruler A B, fig 3, nineteen inches long, is graduated into nineteen equal parts; it has a dovetail groove on its upper edge to receive the perpendicular ruler G, which has one end fitted to it, so as to slide very easily; this ruler is fourteen inches long, and is divided into fourteen equal parts, and upon the back side of it F is a line drawn exactly in the middle, to which is fixed a silken line with a small plummet at the end. The ruler A B is fixed by two screws *a*, *c*, to two pieces of thin brass; and these pieces of brass are fixed at the other ends by two screws *d, e*, to a stronger piece of brass *b f*, which goes close to the ruler A B, and has a joint at X turning upon a screw; below this joint is a piece of round brass about six inches long, which goes into a hole made in the top of the staff, and may be raised higher or lower, by means of a screw S: C D E represents part of this staff, the whole length of which is about three feet, and at the bottom is a rank screw made of iron and fixed to the staff. H I is a wire twenty-two inches long, with a screw at *h* to go into the hole *b*; the piece of brass wire bent into the form *i k* is fixed to the wire H I by the screw *k*; and the part *i* goes into the hole *f* in the brass piece *b f*. The small wire K L is about twelve inches long, and flatted at K, at which place is a little hole above one-eighth of an inch in diameter; this wire K L is fitted to the holes *l, m, n, o*, which are made in the larger wire H I, and it may be placed higher or lower by means of a small screw. This instrument is used in the following manner: fix a paper upon a drawing board, as in fig. 4, and divide the paper lengthways into nineteen equal parts, and perpendicularly into fourteen equal parts; making these divisions greater or smaller according to your design. Then take the staff, and fix it strongly in the ground by means of a screw at bottom, and at a convenient distance from the prospect which you intend to take.

Now put the instrument together as in fig. 5, and fix the ruler A B exactly horizontal by means of the plummet on the perpendicular ruler and the brass joint X; then fix the wire K L, so as to have the eye-hole exactly level with the horizon or equal to the height of the eye, and take care to have the greatest distance of the eye-hole from the ruler equal to the whole length of the longest ruler A B, and never less than the distance *k L*. Having thus fixed the instrument, proceed to make the drawing; look through the eye-hole, and then move the perpendicular ruler in the groove, till you get one edge exactly against some principal object; then will the parts upon the ruler show how high the object is from the bottom of the ruler, i. e. from the bottom of the picture, and you will also know its apparent height; therefore transfer this to the paper in those squares which correspond with the divisions upon the rulers. For the breadth of objects, move the perpendicular ruler so as to be even with the sides of an object, and the divisions upon the lower ruler will show their apparent breadths. After the same manner, get the places and apparent sizes of as many principal objects as are necessary for assisting you, in completing the whole drawing, which may be done by this method with great exactness. When the drawing is finished, the instrument may be taken to pieces and put into a box, which may serve as a drawing board; the top M may be screwed into the staff, which will serve as a walking-stick, and the stool to sit on may be made very portable; so that every part of this apparatus may be carried by one person without any inconvenience. Kirby, b. ii. p. 65, &c. This last instrument has been found particularly convenient in taking views of extensive landscapes, or buildings.

PERSPICA'CIOUS, *adj.* } Lat. *perspicax*.
PERSPICAC'ITY, *n. s.* } Quicksighted; sharp of sight: quickness of sight.

He that laid the foundations of the earth cannot be excluded the secrecy of the mountains; nor can there any thing escape the *perspicacity* of those eyes which were before light, and in whose optics there is no opacity. *Browne.*

It is as nice and tender in feeling as it can be *perspicacious* and quick in seeing. *South.*

PE'RSPICIL, *n. s.* Lat. *perspicillum*. A glass through which things are viewed; an optic glass. Not used.

Let truth be
Ne'er so far distant, yet chronology,
Sharp-sighted as the eagle's eye, that can
Out-stare the broad-beamed day's meridian,
Will have a *perspicil* to find her out,
And through the night of error and dark doubt,
Discern the dawn of truth's eternal ray,
As when the rosy morn buds into day. *Crashaw.*

The *perspicil*, as well as the needle, hath enlarged the habitable world. *Glanville's Scepsis.*

PERSPIC'UOUS, *adj.* } Fr. *perspecuité*;
PERSPIC'UOUSLY, *adv.* } Lat. *perspicuus*.
PERSPIC'UOUSNESS, *n. s.* } Clear; translucent;
PERSPICU'ITY. } transparent; such as may be seen through; the adverb and noun substantive corresponding: perspicuity is more commonly used for clearness to the mind; and hence for precision of expression or language.

The purpose is *perspicuous* even as substance.
Whose grossness little characters sum up. *Shakspeare.*

The case is no sooner made than resolved; if it be made not enwrapped, but plainly and *perspicuously*. *Bacon.*

As contrary causes produce the like effects, so even the same proceed from black and white; for the clear and *perspicuous* body effecteth white, and that white a black. *Peacham.*

As for diaphaneity and *perspicuity*, it enjoyeth that most eminently, as having its earthy and salinous parts so exactly resolved that its body is left imporous. *Browne.*

The verses containing precepts have not so much need of ornament as of *perspicuity*. *Dryden.*

Perspicuity consists in the using of proper terms for the thoughts, which a man would have pass from his own mind into that of another. *Locke.*

All this is so *perspicuous*, so undeniable, that I need not be over industrious in the proof of it. *Sprat.*

PERSPIRE', *v. n.* Lat. *perspiro*. To perform excretion by the cuticular pores.

Hair cometh not upon the palms of the hands or soles of the feet, which are parts more *perspirable*; and children are not hairy, for that their skins are most *perspirable*. *Bacon.*

That this attraction is performed by effluviums, is plain and granted by most; for electricks will not commonly attract, unless they become *perspirable*. *Browne.*

Water, milk, whey, taken without much exercise; so as to make them *perspire*, relax the belly.
Arbuthnot.

In an animal under a course of hard labour, aliment too vaporous or *perspirable* will subject it to too strong a *perspiration*, debility, and sudden death.
Id. on Aliments.

Insensible *perspiration* is the last and most perfect action of animal digestion. *Id.*

How much more considerate this, than if the poet had, from an affected accuracy of description, thrown us into an unmannerly *perspiration* by the heat of the atmosphere; forced us into a landscape of his own planning, with perhaps a paltry good-for-nothing zephyr or two, and a limited quantity of wood and water. *Canning.*

Perspiration, in medicine, is the evacuation of the juices of the body through the pores of the skin. Perspiration is distinguished into sensible and insensible; and here sensible perspiration is the same with sweating, and insensible perspiration that which escapes the notice of the senses. This last is the idea affixed to the word perspiration when used alone. The secretory organ is composed of the extremities of the cutaneous arteries. The smell of the perspirable fluid, in a healthy man, is fatuous and animal; its taste manifestly salt and ammoniacal. In consistence it is vaporous or aqueous; and its specific gravity in the latter state is greater than that of water. For the most part it is yellowish, from the passage of the subcutaneous oil, and sebaceous matter of the subcutaneous glands. Whatever form it takes, the liquid that escapes from the skin is composed, according to Thenard, of a great deal of water, a small quantity of acetic acid, of muriate of soda and potassa, a small quantity of earthy phosphate, an atom of oxide of iron, and a trace of animal matter. Berzelius considers the acid of sweat not the same as acetic acid, but like the lactic acid of Scheel. The skin exhales besides an oily matter, and some carbonic acid.

Experiments have been made to determine the quantity of transpiration which is formed in a given time, and the variations that this quantity undergoes according to circumstances. The first were those of Sanctorius, who, during thirty years, weighed every day, with extreme care, and an indefatigable patience, his food and his drink, his solid and liquid excretions, and even himself. Sanctorius arrived at no exact results. Since his time several philosophers and physicians have been employed on the same subject with more success; but the most remarkable labor in this way is that of Lavoisier and Seguin. These philosophers were the first who distinguished the loss that takes place by pulmonary transpiration from that of the skin.

Seguin shut himself up in a bag of gummed silk, tied above his head, and presenting an opening, the edges of which were fixed round his mouth by a mixture of turpentine and pitch. In this manner only the humor of the pulmonary transpiration passed into the air. In order to know the quantity, it was sufficient to weigh himself, with the bag, at the beginning and end of the experiment, in a very fine balance. By repeating the experiment out of the bag, he determined the whole quantity of humor transpired; so that, by deducting from this the quantity that he knew had passed out from the lungs, he had the quantity of humor exhaled by the skin. Besides, he took into account the food that he had used, his excretions solid and liquid, and generally all the causes that could have any influence upon the transpiration. By following this plan, the results of Lavoisier and Seguin are these:—1. The greatest quantity of insensible transpiration (the pulmonary included) is 25·6 grs. troy per minute; consequently 3 ozs. 1 drm. 36 grs. per hour; and 6 lbs. 4 ozs. 6 drms. 24 grs. in twenty-four hours. 2. The least considerable loss is 8·8 grs. per minute; consequently 2 lbs. 2 ozs. 3 drms. in twenty-four hours. 3. It is during the digestion that the loss of weight occasioned by insensible transpiration is at its minimum. 4. The transpiration is at its maximum immediately after dinner. 5. The mean of the insensible transpiration is 14·4 grs. per minute; in the mean 14·4 grs. 8·8 depend on cutaneous transpiration, and 5·6 upon the pulmonary. 6. The cutaneous transpiration alone varies during and after repasts. 7. Whatever quantity of food is taken, or whatever are the variations of the atmosphere, the same individual, after having augmented in weight by all the food that he has taken, returns, in twenty-four hours, to the same weight nearly that he was the day before, provided he is not growing, or has not eaten to excess.

The cutaneous transpiration has various uses. It keeps up the suppleness of the epidermis, and thus favors the exercise of the tact and the touch. It is by evaporation along with that of the lungs, the principal means of cooling, by which the body maintains itself within certain limits of temperature; also its expulsion from the economy appears very important, for every time that it is diminished or suspended, derangements of more or less consequence follow, and many diseases are not arrested until a considerable quantity of sweat is expelled.

It cannot be doubted that carbon is emitted from the skin; but in what state, the experiments hitherto made do not enable us to decide. Cruickshanks found that the air of the glass vessel in which his hand and foot had been confined for an hour, contained carbonic acid gas; for a candle burned dimly in it, and it rendered lime-water turbid. And Jurine, that air which had remained for some time in contact with the skin consisted almost entirely of carbonic acid gas. The same conclusion may be drawn from the experiments of Ingenhousz and Milly. Trousset has lately observed that air was separated copiously from a patient of his, while bathing.

The skin emits also a particular odorous substance. That every animal has a peculiar smell is well known: the dog can discover his master, and even trace him to a distance by the scent. Cruickshanks has made it probable that this matter is an oily substance, or at least that there is an oily substance emitted by the skin. He wore repeatedly, night and day, for a month, the same under waistcoat of fleecy hosiery, during the hottest part of the summer. At the end of this time he always found an oily substance accumulated in considerable masses on the nap.

of the inner surface of the waistcoat, in the form of black tears. When rubbed on paper, it rendered it transparent, and hardened on it like grease. It burned with a white flame, and left behind it a charry residuum.

Berthollet has concluded that the acid which is present is the phosphoric; but this has not been proved. Fourcroy and Vauquelin have ascertained that the scurf which collects upon the skins of horses consists chiefly of phosphate of lime, and urea is even sometimes mixed with it. According to Thenard, however, the acid contained in sweat is the acetous; which, he likewise observes, is the only free acid contained in urine and in milk, this acid existing in both of them when quite fresh.

His account of his examination of it is as follows:—The sweat is more or less copious in different individuals; and its quantity is perceptibly in the inverse ratio of that of the urine. All other circumstances being similar, much more is produced during digestion than during repose. The maximum of its production appears to be twenty-six grains and two-thirds in a minute; the minimum nine grains, troy weight. It is much inferior, however, to the pulmonary transpiration; and there is likewise a great difference between their nature and manner of formation. The one is a product of a particular secretion, similar in some sort to that of the urine; the other, composed of a great deal of water and carbonic acid, is the product of a combustion gradually effected by the atmospheric air. The sweat, in a healthy state, very sensibly reddens litmus paper or infusion. In certain diseases, and particularly in putrid fevers, it is alkaline; yet its taste is always rather saline, and more similar to that of salt than acid. Though colorless, it stains linen. Its smell is peculiar, and insupportable when it is concentrated, which is the case in particular during distillation. But before he speaks of the trials to which he subjected it, and of which he had occasion for a great quantity, he describes the method he adopted for procuring it, which was similar to that of Cruickshanks. Human sweat, according to Thenard, is formed of a great deal of water, free acetous acid, muriate of soda, an atom of phosphate of lime and oxide of iron, and an inappreciable quantity of animal matter, which approaches much nearer to gelatin than to any other substance.

Perspiration varies in respect to, 1. *The temperature of the atmosphere.*—Thus men have a more copious, viscid, and higher-colored sweat in summer than in winter, and in warm countries, than in colder regions. 2. *Sex.*—The sweat of a man is said to smell more acrid than that of a woman. 3. *Age.*—The young are more subject to sweat than the aged, who, during the excessive heat of the summer, scarcely sweat at all. 4. *Ingesta.*—An alliacious sweat is perceived from eating garlick; a leguminous from peas; an acid from acids; a fetid from animal food only; and a rancid sweat from fat foods, as is observed in Greenland. A long abstinence from drink causes a more acrid and colored sweat; and the drinking a great quantity of cold water in summer a limpid and thin sweat. 5. *Medicines.*—The sweat of those who have taken musk, even moderately, and assafœtida, or sulphur, smells of their respective natures. 6. *Region of the body.*—The sweat of the head is greasy; on the forehead it is more aqueous; under the axillæ very unguinous; and in the interstices of the toes it is very fetid, forming in the most healthy man blackish sordes. 7. *Disease.* In this respect it varies very much in regard to quantity, smell, and color; for the sweat of gouty persons is said to turn blue vegetable juices to a red color. Some men also have a lucid sweat, others a sweat tinging their linen of a cerulean color.

PERSUADE', *v. a.*
PERSUA'DER, *n. s.*
PERSUA'SIBLE, *adj.*
PERSUA'SIBLENESS, *n. s.*
PERSUA'SION, *n. s.*
PERSUA'SIVE, *adj.*
PERSUA'SIVELY, *adv.*
PERSUA'SIVENESS, *n. s.*
PERSUA'SORY, *adj.*

Fr. *persuader;* Span. and Port. *persuadir;* Ital. and Lat. *persuadere, persuadeo.* To induce; bring to an opinion; influence by expostulation or argument; inculcate by argument. Dr. Johnson says, 'persuasion seems rather applicable to the passions, and argument to the reason;' but this is not always observed: in an obsolete sense, to treat by persuasion: a persuader is one who thus treats or influences another; an officious adviser or importuner: persuasible is to be persuaded; the noun substantive that follows corresponding: persuasion is the act of persuading; state of being persuaded, or opinion to which one is persuaded: persuasive and persuasory, having the power to persuade or influence by argument; the adverb and noun substantive corresponding.

Let every man be fully *persuaded* in his own mind. *Romans.*

We are *persuaded* better things of you, and things that accompany salvation. *Hebrews* vi. 9.

Joy over them that are *persuaded* to salvation. *Esdras* vii.

They that were with Simon, being led with covetousness, were *persuaded* for money. 2 *Mac.* x.

Philoclea's beauty not only *persuaded*, but so *persuaded* as all hearts must yield: Pamela's beauty used violence, and such as no heart could resist. *Sidney.*

In prayer, we do not so much respect what precepts art delivereth, touching the method of *persuasive* utterance in the presence of great men, as what doth most avail to our own edification in piety and godly zeal. *Hooker.*

The most certain token of evident goodness is, if the general *persuasion* of all men does so account it. *Id.*

Twenty merchants have all *persuaded* with him;
But none can drive him from the envious plea
Of forfeiture. *Shakspeare.*

You are abused in too bold a *persuasion.* *Id.*

The earl, speaking in that imperious language wherein the king had written, did not irritate the people, but made them conceive, by the haughtiness of delivery of the king's errand, that himself was the author or principal *persuader* of that counsel. *Bacon.*

Let Martius resume his farther discourse, as well for the *persuasive* as for the consult, touching the means that may conduce unto the enterprize. *Id.*

He soon is moved
By such *persuaders* as are held upright. *Daniel.*

An opinion of the successfulness of the work being as necessary to found a purpose of undertaking it, as either the authority of commands, or the *persuasiveness* of promises, or pungency of menaces can be. *Hammond's Fundamentals.*

To children, afraid of vain images, we *persuade* confidence by making them handle and look nearer such things. *Taylor.*

How incongruous would it be for a mathematician to *persuade* with eloquence, to use all imaginable insinuations and intreaties, that he might prevail with his hearers to believe that three and three make six! *Wilkins.*

Hunger and thirst at once,
Powerful *persuaders!* quickened at the scent
Of that alluring fruit, urged me so keen. *Milton.*
The serpent with me
Persuasively hath so prevailed, that I
Have also tasted. *Id.*

To sit cross-legged, or with our fingers pectinated, is accounted bad, and friends will *persuade* us from it. *Browne.*

Neither is this *persuasory.* *Id.*

If't prove thy fortune, Polydore, to conquer,
For thou hast all the arts of fine *persuasion,*
Trust me, and let me know thy love's success. *Otway.*

I should be glad, if I could *persuade* him to write such another critick on any thing of mine; for when he condemns any of my poems, he makes the world have a better opinion of them. *Dryden.*

Let a man be ever so well *persuaded* of the advantages of virtue, yet, till he hungers and thirsts after righteousness, his will will not be determined to any action in pursuit of this confessed great good. *Locke.*

Many who live upon their estates cannot so much as tell a story, much less speak clearly and *persuasively* in any business. *Id.*

The obedient and the men of practice shall ride upon those clouds, and triumph over their present imperfections; till *persuasion* pass into knowledge, and knowledge advance into assurance, and all come at length to be completed in the beatific vision. *South.*

Notwithstanding the weight and fitness of the arguments to *persuade,* and the light of man's intellect to meet this *persuasive* evidence with a suitable assent, no assent followed, nor were men thereby actually *persuaded.* *Id.*

It makes us apprehend our own interest in that obedience, makes us tractable and *persuasible,* contrary to that brutish stubbornness of the horse and mule, which the Psalmist reproaches. *Government of the Tongue.*

When we have no other certainty of being in the right, but our own *persuasions* that we are so; this may often be but making one error the gage for another. *Id.*

Men should seriously *persuade* themselves, that they have here no abiding place, but are only in their passage to the heavenly Jerusalem. *Wake.*

Thus, a tune, a proverb, a scrap of poetry, or some other trivial object, will steal into the thoughts, and continue to possess them long after it ceases to be amusing. *Persuasives* to dismiss a guest that proves so troublesome, can hardly be necessary; and bodily exertion is generally the best remedy for this mental infirmity. *Percival.*

PERT, *adj.*, PERT'LY, PERT'NESS. } Welsh, *pert*; Belg. *pert*; Fr. *appert*; Qu. Lat. *paratus*, ready? Lively; brisk; smart; dapper: the adverb and noun substantive corresponding.

Awake the *pert* and nimble spirit of mirth;
Turn melancholy forth to funerals. *Shakspeare.*
Yonder walls, that *pertly* front your town,
Yond towers, whose wanton tops do buss the clouds,
Must kiss their own feet. *Id.*
On the tawny sands and shelves,
Tript the *pert* fairies and the dapper elves. *Milton.*

From *pert* to stupid sinks supinely down,
In youth a coxcomb, and in age a clown. *Spectator.*

A lady bids me in a very *pert* manner mind my own affairs, and not pretend to meddle with their linen. *Addison.*

All servants might challenge the same liberty, and grow *pert* upon their masters; and, when this sauciness became universal, what less mischief could be expected than an old Scythian rebellion? *Collier on Pride.*

I find no other difference betwixt the common town-wits and the downright country fools, than that the first are *pertly* in the wrong, with a little more gaiety: and the last neither in the right nor the wrong. *Pope.*

Dulness delighted eyed the lively dunce,
Remembering she herself was *pertness* once. *Id.*
Vanesso
Scarce listened to their idle chat,
Further than sometimes by a frown,
When they grew *pert*, to pull them down. *Swift.*

When you *pertly* raise your snout,
Fleer, and gibe, and laugh, and flout;
This, among Hibernian asses,
For sheer wit and humour passes. *Id.*

There is in Shaftesbury's works a lively *pertness* and a parade of literature; but it is hard that we should be bound to admire the reveries. *Watts.*

PERTAIN, *v. n.* Lat. *pertineo.* To belong; to relate; appertain.

As men hate those that effect that honour by ambition, which *pertaineth* not to them; so are they more odious, who through fear betray the glory which they have. *Hayward.*

A cheveron or rafter of an house, a very honourable bearing, is never seen in the coat of a king, because it *pertaineth* to a mechanical profession. *Peacham.*

PERTH, an ancient and celebrated city of Scotland, the capital of Perthshire, and formerly of the whole kingdom, is situated in a fine but low plain on the west bank of the Tay, which takes a bend to the east about a mile below the city. The waters of the Almond are also brought to the town by a canal. Portions of the plain north and south are called the North and South Inches, each of which is about a mile and a half in circumference, and is used both for the profit and pleasure of the inhabitants. On the north Inch is a good race ground.

The old part of the town is uniform in its plan, consisting of four streets from east to west, crossed by others at right angles. At the east end of High Street stood the old town house, county hall and prison, now rebuilding after a design by Smirke, on the site of the former palace of the Gowrie family. In the High Street is the guildhall, a plain building, and at the west end of it a modern church, with a steeple 140 feet high. In George Street is the public coffee room, also a handsome modern building. There are several other good halls in the city, particularly that of the royal arch mason lodge, on the site of the ancient parliament house of Scotland. A little to the south and west of the new church is an old hospital, founded by James VI., now used as warehouses. Between the High Street and the South Street stands the church of St. John the Baptist, a building of very great antiquity, with a high spire, and is fitted up for three places of worship called the East, Middle, and West kirks. Chapels for the dissenters are also numerous. The episcopal chapel in Prince's Street is a very elegant building.

The whole of the Blackfriars ground on the north, and a considerable space of ground on the south side of the town, have within these twenty years been laid out for buildings, and a New Town may be then said to have arisen, containing a considerable number of streets, with many noble houses. Adjoining the North Inch is a crescent, place, and terrace, the latter a row of very fine buildings, in the centre of which is the Seminaries, a handsome fabric, where the various branches of education are taught. An elegant new theatre forms the western termination of the crescent, and a fine barrack terminates Athol Street in the same direction. At the extremity of South Inch stands a depôt, built by government for the reception of prisoners of war, now used for military stores. It is considered one of the most complete and well arranged establishments of this kind in Great Britain. Two banking companies belong to the town, and there is also a branch of the bank of Scotland, and another of the British Linen Company, established here. The grammar-school of Perth has long been accounted one of the best in Scotland, and has produced many eminent statesmen and scholars. A literary and antiquarian society has also been established.

Perth was only provided formerly with a wooden bridge over the Tay. This gave place in 1772 to a new one of stone, designed by Mr. Smeaton, and begun in 1766. It consists of ten arches, is 906 feet in length, and twenty-two in breadth, and was built at an expense of about £30,000. At the east end of the bridge is the bridge end or burgh of Kinnoul.

The salmon fishery on the Tay is very extensive, and the annual rent may be estimated at about £7000, of which Perth shares about £1000. The salmon are sent to London, packed in ice or pickled; a smack sailing every third or fourth day during the season. The staple manufacture of Perth is linen; but of late the cotton manufacture has greatly rivalled it. There are upwards of 2500 looms employed in the town, which manufacture linen and cotton goods, besides extensive manufactures of leather articles of all kinds. In the neighbourhood are various manufacturing villages, of which Tulloch, Craigee-mill, and Muirtoun of Dalhousie, are in the parish of Perth.

Perth is a royal borough, and joins with Dundee, Forfar, Cupar of Fife, and St. Andrews, in electing a representative in the British imperial parliament. It had a royal charter from king David I., who died in 1153, and which was renewed and confirmed by another from king William I. in 1210, which is still extant. It is governed by a provost, four bailies (viz. three merchants and one tradesman), a dean of guild, treasurer, and nineteen counsellors. It gave formerly the title of earl to the Drummond family, and the fourth earl was created duke of Perth by James II.: but all the titles of the family became forfeited by its attachment to the Stuarts.

Various accounts are given of the origin and ancient history of this place: some writers ascribing its first foundation to the Roman general Agricola; who is said to have fixed his camp here about A.D. 70, from the resemblance of the scenery to that of Rome. The soldiers, when they first saw the river Tay, and the adjacent plain, are recorded to have exclaimed, 'Ecce Tiber! Ecce Campus Martius!' Behold the Tiber! Behold the field of Mars! Hence the Tay, we are told, was called New Tiber, by the Italians; and Fordun, a Scottish historian, gives the name of Tyber-Mere, to an extensive moor west of the town. An aqueduct, said to have been constructed here by Agricola, is still in existence. When the town was fortified it supplied the ditches.

Necham, an English writer, who gave lectures on history at Paris in 1180, describes Perth as a place of opulence; and, in 1210, according to the Scottish historians, it was strongly fortified by king William, who renewed its charter, and granted many additional privileges to the city. At this time, and indeed until the reign of the Stuart family, Perth was reckoned the capital city of Scotland, when kings were crowned at Scone. Between the years 1201 and 1459 no fewer than fourteen parliaments were held here. It was then likewise, as it is still, an extensive commercial town. Fordun says that the merchants of Perth visited, in their own ships, the Hanse Towns.

The Flemings of this and the following century also frequented the port of Perth, and individuals of that nation connected with the linen and woollen manufactures appear to have fixed their abode in the town. King William, however, put the foreign merchants of Perth under restrictions; and, to prevent the settlement of foreign manufacturers there, granted in his charter that the burgesses might have a merchant guild of their own, 'fullers and weavers excepted.' Edward I. of England made it the residence of his deputies: Robert Bruce attacked this town in 1306 and 1311, but was repulsed on the former occasion by the earl of Pembroke; on the latter, after an obstinate siege of six weeks, he succeeded in storming the fortifications, which he levelled with the ground. After the battle of Duplin these were rebuilt by Edward Baliol. In 1335 our Edward III. took possession of Perth, and resided in it. John, earl of Cornwall, brother to that monarch, is said to have died here in October 1336; receiving, according to Fordun, his mortal wound from the king's own dagger. In 1339 Perth endured a long siege by the regent Robert, and was only taken by draining the ditch. In 1437 James I. of Scotland was murdered at the Black Friars' monastery by Robert Graham, who wounded him in twenty-eight different places, and the queen twice. The king's wardrobe was long preserved in this town. At this period the town walls seem to have been in a state of demolition; as we find them repaired, at a very considerable expense, by James II. In his reign the earl of Gowrie's house here was the scene of one of the most remarkable events in Scottish history, i. e. the 'Gowrie conspiracy,' by John earl Ruthven, and his brother Alexander. These young men, according to the published account of the royal party, having prevailed upon the king to visit Perth (on the pretence of bringing to him a traitor whom they had taken), attempted to murder him; when his attendants slew them both; upon which the inhabitants of the town assembled round the house, threatening revenge, and they were with difficulty diverted from the purpose. In 1545 five men and a woman were burnt here for heresy. On the 11th of May, 1559, John Knox preached a sermon in the kirk against idolatry; and, by the indiscretion of a priest, a mob was raised, which destroyed all the monasteries and religious houses in the town. This year a select band of 300 reformers marched out of Perth to Stirling, with ropes about their necks, to hang the first that fled: and hence arose the phrase, 'St. Johnston's ribands.'

Perth, after the battle of Tibbermoor, was seized by the marquis of Montrose; and in 1651 was taken by Cromwell, who built a citadel on the South Inch. In 1715 the earl of Marr obtained possession of it, and occupied it for the Stuarts, till after the battle of Dunblane, on Sheriff-muir, when they were dislodged by the duke of Argyle. In 1745, also, prince Charles was proclaimed here, and appointed new magistrates.

Since this period Perth has greatly risen in importance: the civil wars were of considerable benefit to it, by inducing a number of the Commonwealth's soldiery to settle here; and the resort of the various respectable families who so long adhered to the Stuart race, and the passage of the conflicting forces, contributed also to increase and establish its trade.

PERTH, or PERTHSHIRE, a county of Scotland, has the shire of Inverness and Aberdeen on the north; Angus or Forfar, Fife, and Kinross, on the east; Clackmannan and Stirling on the south; and Dunbarton and Argyle on the west; containing about 2638 square miles, of which fifty are occupied by lakes; or, in all, 1,688,320 English acres; being, next to Inverness-shire, the largest county of the mainland of Scotland. Its greatest extent, from east to west, is about seventy-seven miles, and from north to south sixty-eight.

Anciently it was divided into eight districts, containing seventy-nine parishes; Atholl, Stormont, Perth Proper, Gowrie, Strathearn, Monteith, Breadalbane, and Rannoch; and is under the jurisdiction of a sheriff, who has substitutes in the towns of Perth and Dunblane. The Highlands occupy about two-thirds of the surface: the Lowlands being chiefly situated on the eastern and southern extremities, which contain some of the richest tracts in Great Britain; and to the west, where the Grampians first rise, for almost the whole breadth of the county the high grounds are penetrated by straths and glens, of considerable extent, each traversed by its own streams, and diversified by numerous lakes. At least seven of these mountains are upwards of 3000 feet high: the highest being Benlawers, on the west side of Loch Tay; Benmore, south-west; and Schehallion, north-east. The following is a table of the principal elevations:—

Elevation.	Feet.
Dunsinnan Hill	1040
Kinseat Hill . . .	1179
Demyet	1345
Tortum	1400
Birnam Hill . . .	1580
Ben Clach (Ochil) . .	2420
Farragon	2584
Ben Chenzie (Strathearn) .	2922
Ben Vorlich . . .	3300
Ben Doig	3550
Ben Ledi	3009
Schichallion	3564
Ben Gload	3724
Ben More	3903
Ben Lawers	4015

The most considerable lakes are—Loch Tay, in the centre of the Highland district, about fifteen miles long, and one broad, with a depth varying from fifteen to 100 fathoms; Loch Ericht, on the north-west, extending into Inverness-shire, still longer, but not so broad; Loch Rannoch, south-east of the former, twelve miles long; Loch Earn, south from Loch Tay; and Lochs Vennachar, Achray, and Katrine, on the south-west. Most of the streams have their source in these lochs, or receive their waters as they pass them. The rivers are the Tay, Forth, Earn, Teath, and Isla; of which the two first are by far the largest. The Tay, the largest river in Scotland, has its source on the western border of Perthshire (to which county it is confined), under the name of the Dochart, and, soon after entering Loch Dochart, flows thence north-east till it falls into Loch Tay. Leaving Loch Tay, from which it now takes its name, it pursues first a north-easterly and then a southerly course to Dunkeld, from which it proceeds eastward, and then south, through a rich country, till it falls into the Frith of that name, a little below Perth; having been joined by the Almond and other streams in its course, which is not less than ninety miles. South of Loch Tay is Loch Earn, where the river of that name rises, and which, flowing east and south, through Strathearn and by the town of Crieff, after a course of twenty-four miles, falls, at Rhind, into the Frith of Tay. On the banks of this river, near its confluence with the Tay, is Pitcaithly, long celebrated for its mineral springs. There are also springs at DUNBLANE, which see.

In the central parts of this county the winters are stormy and severe; and, on the banks of the rivers, hoar-frosts are frequently very injurious in summer. On the east the climate is mild; and the thermometer, on an average of twelve years, has stood at 50°.

Perthshire has coal-mines at Culross, a small detached tract on the Forth; but, from the general want of coal, limestone, which is found in many parts of the county, is of little value. Some years ago a machine was erected for pounding limestone for manure; but the experiment failed. In the higher grounds the prevailing rock is granite, and in the lower sandstone. On the southern ridges, or skirts of the mountains, both slate and freestone are found in abundance; but here the great sandstone stratum of Scotland terminates, in like manner as the coal field does to the southward of the Ochils. Hence it may be remarked that Perthshire contains within itself the boundary between the sandstone and the granite; for the former is only discovered in small patches to the north, and the latter seldom shows itself to the south, except in Galloway. What is curious, the secondary minerals on the ridges of the Grampians, such as slate, limestone, and even sandstone, seem to be affected in their properties by the proximity, or intermixture, of the primary rocks. Thus, below Murphy, in the parish of Little Dunkeld, is an inexhaustible body of a very fine grained freestone, which is of a light livid ash color, and so hard as to resist the action of the atmosphere for many centuries. The cathedral of Dunkeld was built of stones from this district, and fully corroborates the above assertion. In the hills of Birnam the slate is of a very deep blue color, bordering on violet; and the same is nearly the character of the limestone found at Rannoch, Glenlyon, Breadalbane, and the head of Strathearn. In Monteath is also a quarry of the same mineral, resembling marble, of a blue ground, with streaks of white. Iron stone appears in some parts; but no mines of that metal have ever been opened, except on the southern side of the Ochils, about Culross. A lead mine was wrought for many years near Tyndrum, in Breadalbane, as was likewise one in Glenlyon, but these are now both abandoned. Some lead ore was also discovered, about twenty years back, in the mountain of Ben-Ledi. One vein, on the north-east side of the mountain, was found to be extremely rich in silver, but its dimensions were too small to admit of its being wrought. In the hill of Birnam also several pieces of lead ore have been dug up. This ore was encrusted with a white sparry, or rather quartzose, substance; one piece, about six pounds in weight, consisted of unmixed compact ore, which produced a considerable portion of pure lead. It was found at the base of the hill.

Slates are abundant in different parts of the county. The principal stratum commences on the borders of Loch Lomond, in Dunbartonshire, and seems to terminate near Dunkeld. They are of two kinds, the blue and the gray slate. The former, which are by far the most valuable, are plentiful in Monteath, and along the north side of the Ochils. Gray slates also are found in vast quantities in the same districts, as well as in Strathallan and Strathearn. They consist of sandstone, which may be split into thin layers, six feet square; and are, since the introduction of blue slates in roofing, chiefly used for malt-kilns, floors, and pavement. In the parish of Wester Foulis is a blue slate quarry of great value; but it is not wrought to any very considerable extent, on account of its distance from water carriage. The best freestone quarries are those in the parish of Tulliallan on the Forth, and on the estate of Milnfield, in the south-eastern corner of the county. Shell-marl abounds in Stormont and Strathearn.

The alluvial soil on the banks of the rivers is in many parts of the richest quality, and of considerable extent. The Carse of Gowrie is a tract of about 18,000 acres, situated on the north and north-west banks of the Frith of Tay, and has long been celebrated for its orchards, of all sizes. Perthshire has red and fallow deer, and roes, rabbits, pigeons, and poultry; and abundance of the other game of the Highlands. It is much ornamented by the numerous seats of its proprietors, and has two royal burghs, Perth and Culross. Perth is a place of great antiquity, formerly the usual residence of the Scottish sovereigns, who were crowned at Scone in its vicinity, and the seat of parliaments and courts of justice. Some of the most important events in Scottish history, both of a religious and military description, occurred here. It is now a well built thriving town, containing, in 1811, about 17,000 inhabitants. About seventy other towns and villages are scattered over the county, the most considerable of which have been already described in the Encyclopædia.

The chief manufactures are linen, cotton, leather, and paper. As well as extensive bleach-fields, print-fields, and cotton-mills, it has mills for extracting oil from seed, and for the spinning of flax and wool. The exports are corn, linen and linen-yarn, cottons, boots and shoes, salmon, and coals; and it imports lime in great quantities, some of the materials of its manufactures, and many domestic articles.

Perth, Articles of. The *five articles of Perth*, so called because they were carried by the influence of the court and bishops at a convention or assembly summoned to meet at Perth, August 25th, 1618, are as follow:—1. That the holy sacrament should be received kneeling. 2. That ministers should be obliged to administer the sacrament in private houses to the sick, if they desired it. 3. That ministers might baptise children privately at home, in cases of necessity, only certifying it to the congregation the next Lord's day. 4. That ministers should bring such children of their parish as could say their catechism, and repeat the Lord's prayer, creed, and ten commandments, to the bishops, that they might confirm them and give them their blessing. 5. That the festivals of Christmas, Easter, Whitsuntide, and the Ascension of our Saviour, should for the future be commemorated in the church of Scotland. The king ordered these articles to be published at the market-crosses of the several boroughs, and the ministers to read them in their pulpits; but most of the ministers refused, as they were sanctioned by no penalty except the king's displeasure. The king, however, determining to obtain the ratification of parliament, issued a proclamation, commanding all ministers who opposed them, and who were preparing a supplication against them, to leave the city of Edinburgh within twenty hours. The ministers obeyed, leaving behind them a protestation against the articles, and an admonition to the members of parliament not to ratify them, as they would answer it in the day of judgment. The court interest prevailed, and the articles were ratified, contrary to the sense of the kirk and nation. This measure occasioned a persecution through the kingdom, and many of the Presbyterian ministers were fined, imprisoned, and banished by the high commission. Thus far the arbitrary and erudite James I. proceeded towards the restitution of episcopacy in Scotland; but there was still wanting for the completion of the work a public liturgy, or book of common prayer. An insurrection through the whole kingdom being apprehended, he desisted from enforcing this unwise measure, and left it to be finished by his son, whose imposition of it upon the kirk, without consent of parliament or general assembly, set fire to the discontents of the people, which had been gathering for so many years.

PERTINA'CIOUS, *adj.*, PERTINA'CIOUSLY, *adv.*, PERTINA'CIOUSNESS, *n. s.*, PERTINAC'ITY, PER'TINACY. Latin, *pertinax.* Obstinate; stubborn; stickling; used, however, in a good sense by South, or as meaning resolute; firm; constant: the adverb and noun substantive follow these senses: pertinacity and pertinacy also mean obstinacy; stubbornness; steadiness; see the extract from Taylor.

They deny that freedom to me which they *pertinaciously* challenge to themselves. *King Charles.*

Their *pertinacity* is such, that when you drive them out of one form, they assume another. *Duppa.*

St. Gorgonia prayed with passion and *pertinacy*, till she obtained relief. *Taylor.*

It (harsh speech) maketh them indocile and intractable, averse from better instruction, *pertinacious* in their opinions, and refractory in their ways. *Barrow.*

In this reply was included a very gross mistake, and, if with *pertinacity* maintained, a capital errour. *Browne.*

One of the dissenters appeared to Dr. Sanderson to be so bold, so troublesome and illogical in the dispute, as forced him to say, that he had never met with a man of more *pertinacious* confidence and less abilities. *Walton.*

Others have sought to ease themselves of all the evil of affliction by disputing subtily against it, and *pertinaciously* maintaining that afflictions are no real evils, but only in imagination. *Tillotson.*

It holds forth the *pertinacy* of ill fortune, in pursuing people into their graves. *L'Estrange.*

Metals *pertinaciously* resist all transmutation; and though one would think they were turned into a different substance, yet they do but as it were lurk under a visard. *Ray.*

Diligence is a steady, constant, and *pertinacious* study, that naturally leads the soul into the knowledge of that which at first semed locked up from it. *South.*

PER'TINENT, *adj.*, PER'TINENCE, *n. s.*, PER'TINENCY, PER'TINENTLY, *adv.*, PER'TINENTNESS, *n. s.* Fr. *pertinent*; Lat. *pertinens*, *pertineo.* Relative; apposite; exactly to purpose; relating; concerning: pertinence, pertinency, and pertinentness, mean appositeness; relevancy; justness of relation.

Men shall have just cause, when any thing *pertinent* unto faith and religion is doubted of, the more willing to incline their minds towards that which the sentence of so grave, wise and learned in that faculty shall judge most sound. *Hooker.*

My caution was more *pertinent*
Than the rebuke you give it.
Shakspeare. Coriolanus.

I set down, out of experience in business, and conversation in books, what I thought *pertinent* to this business. *Bacon.*

Here I shall seem a little to digress, but you will by and by find it *pertinent.* *Id.*

Be modest and reserved in the presence of thy betters, speaking little, answering *pertinently*, not interposing without leave or reason. *Taylor.*

Modest, sober, and *pertinent* discourse would appear far more generous and masculine, than such mad hectoring the Almighty, such boisterous insulting over the received laws and general notions of mankind. *Barrow on Vain Swearing.*

If he could find *pertinent* treatises of it in books, that would reach all the particulars of a man's behaviour; his own ill-fashioned example would spoil all. *Locke.*

I have shewn the fitness and *pertinency* of the apostle's discourse to the persons he addressed to, whereby it appeareth that he was no babbler, and did not talk at random. *Bentley.*

PERTINAX, an illustrious Roman emperor, who flourished about A.D. 170. He was descended of a mean family; and like his father, who was either a slave or the son of a slave, he for some time followed the employment of making charcoal. His poverty did not, however, prevent him from receiving a liberal education. For some time he was employed in teaching the Greek and the Roman languages in Etruria. He next became a soldier, and by his valor rose to the highest offices in the army, and was made consul by M. Aurelius. He was afterwards made governor of Mœsia, and at length of Rome itself. When Commodus was murdered, Pertinax was universally chosen to succeed to the imperial dignity. He complied with reluctance; but his mildness, his economy, and popularity, convinced the senate and people of the propriety of their choice. He forbad his name to be inscribed on any part of the imperial domains, insisting that they belonged not to him but to the public. He melted the silver statues which had been raised to Commodus, and sold all his concubines, horses, arms, and other instruments of his pleasure. With the money thus raised, he abolished all the taxes which that prince had imposed. These patriotic actions gained him the affection of the worthiest of his subjects; but, when he attempted to introduce among the pretorian guards proper discipline, the minds of the soldiers were totally alienated. Pertinax was apprized of their mutinying; but, instead of flying, he boldly addressed them; and they had begun to retire, when one of the most seditious advanced, and darting a javelin at his breast, exclaiming, 'The soldiers send you this.' The rest followed the bloody example; and Pertinax, muffling up his head, and calling upon Jupiter to avenge his death, was immediately despatched. This abominable murder happened A. D. 103. It was no sooner known than the enraged populace flocked from all quarters, and uttering dreadful menaces against the authors of his death, ran up and down the streets in quest of them; but the senate had not the courage to avenge it. Such was the lamented end of Pertinax, after he had lived sixty-six years, seven months, and twenty-six days; and reigned, according to Dio Cassius, only eighty-seven days. His remains were interred with great pomp by Didius Julianus, his successor. Septimius Severus assumed the name of Pertinax, and punished with great severity all who had been accessory to his death; disbanded the Prætorian guards, pronounced his panegyric, and caused him to be ranked among the gods, appointing his son chief priest. The day of his accession and his birthday were celebrated for many years.

PERTUIS, in military affairs, a narrow passage which is made in the shallow parts of a river, for the facility of navigation. This passage is sometimes confined with flood-gates, in order to raise or lower the waters according to circumstances.

PERTUISANE, a halbert which has a longer and broader iron at the end than the common halberts have. They have been disused since the close of the seventh century.

PERTURB', *v. a.* } Lat. *perturbo*. To disquiet; to disturb;
PERTUR'BATE, *v. a.* } disorder; deprive of
PERTURBA'TION, *n. s.* } tranquillity: perturbation is disturbance; restlessness; disquiet; cause of disquiet. But we only find it in Shakspeare in this last sense.

His wasting flesh with anguish burns,
And his *perturbed* soul within him mourns. *Sandys.*

Rest, rest, *perturbed* spirit. *Shakspeare.*

O polished *perturbation!* golden care!
That keep'st the ports of slumber open wide,
To many a watchful night: sleep with it now,
Yet not so sound, and half so deeply sweet,
As he, whose brow with homely biggen bound,
Sleeps out the watch of night. *Id. Henry IV.*

Natures that have much heat, and great and violent desires and *perturbations*, are not ripe for action, till they have passed the meridian of their years. *Bacon's Essays.*

Restore yourselves unto your temper, fathers;
And, without *perturbation*, hear me speak. *Ben Jonson.*

They are content to suffer the penalties annexed, rather than *perturb* the public peace. *King Charles.*

Love was not in their looks, either to God,
Nor to each other; but apparent guilt,
And shame, and *perturbation*, and despair. *Milton.*

The inservient and brutal faculties controuled the suggestions of truth; pleasure and profit overswaying the instructions of honesty, and sensuality *perturbing* the reasonable commands of virtue. *Browne.*

The soul, as it is more immediately and strongly affected by this part, so doth it manifest all its passions and *perturbations* by it. *Ray.*

PERTU'SION, *n. s.* Lat. *pertusus*. The act of piercing or punching.

An empty pot without earth in it, may be put over a fruit the better, if some few *pertusions* be made in the pot. *Bacon.*

The manner of opening a vein in Hippocrates's time, was by stabbing or *pertusion*, as it is performed in horses. *Arbuthnot.*

PERTUSIS, chincough. See MEDICINE, Index.

PERU, once the largest of the Spanish vice-royalties in South America, is at present a small independent state, whose natural features, and much of whose political history we have already given in the article AMERICA, SOUTH.

We need only observe here that it is now generally considered as situated between 3° 25' and 21° 30' S. lat., and 65° and 81° 10' W. long. It is bounded on the north by the republic of Columbia; east by Brasil; south by the desert of Atacama, which separates it from Chili, and by the United Provinces of South America; and west by the Pacific Ocean. Its mean length from north to south is about 750 miles, and its mean breadth about 660, the area being about 495,000. But the sinuosities of the shore are so considerable as to give a course of upwards of 1000 miles.

The Andes penetrate this territory from south-east to north-west nearly parallel with the coast, in three principal ridges or cordilleras, which continue till about 6° of S. lat., where they unite into a single chain. Along the whole coast or water side is a narrow plain, from thirty-five to seventy miles wide, called the country of Valles, consisting of a succession of barren sandy deserts. Immediately east of this is the lower or western ridge of the Andes, reaching the whole length of Peru; not in one unbroken elevation, like the cordillera of Mexico, but composed of successive summits of immense height, between which the eastern inhabitants find a laborious passage to the country of Valles. Between the western and central ridges there is a series of plains, varying in width from 100 to 170 miles, elevated generally 8000 or 10,000 feet above the level of the ocean, and separated from each other by deep valleys. The central cordillera consists also of separate summits, less broken than the western, and has an average height of 15,000 feet. Beyond the eastern cordillera there are immense unexplored plains, which reach into Brasil, and traversed from south to north by the principal mountain tributaries of the Amazon.

So far as the cultivation of the coast district has extended, it is powerfully aided by a species of manure peculiar to this part of Peru, and whose qualities seem to be derived from the singular circumstance of no rain falling here. On the islands, the resting-places of millions of aquatic birds, their dung has accumulated in the course of ages, so as to form hills of more than 100 feet in height, close to the shore, whence it is conveyed by small vessels to the main-land. The dung thus collected, not having its salts diluted by rain, and being but slightly affected by the sun, has retained, according to the analysis of Sir Humphry Davy, a greater proportion of ammonia than any substance that has yet been applied to land as manure. In this district most of the tropical fruits can be reared on the banks of the small streams, or assisted by artificial irrigation.

The sides of the Andes nearest the Pacific Ocean are covered with forests, made almost impenetrable by the numerous parasitical plants which twine round the trees. These forests yield acacias, mangle trees, arborescent brooms, and ferns; aloes and other succulent plants;

cedars, cotton, or Cuba trees of gigantic magnitude, and many kinds of ebony, and other useful woods.

The lofty plains between the Andes are perpetually verdant; and the grains, the vegetables, and fine fruits of Europe, flourish here amidst those of the torrid zone. Wine, oil, and sugar, are the most valuable productions of the coast; and corn, wheat, Peruvian bark, and cacao, of the high country.

The *rivers* on the west side of the Andes are mere mountain streams of short course; on the eastern side rise the Arragon and its tributaries.

The mountainous districts are of far-famed metallic wealth. Recently the number of gold mines and washings worked in Peru was sixty-nine, the number of silver mines 784, of quicksilver four, of copper four, and of lead twelve. The annual produce of the whole is valued at 4,500,000 dollars, of which silver constitutes seven-eighths. These rich mines, however, have always been under bad management, and their produce is hence very inferior to what it might be made. Those that are most productive are the mines of Pasco, in the province of Tarma. They are situated on a high table land, which rises more than 13,000 feet above the level of the sea, and were discovered in 1630, by Huari Capac, an Indian. The metalliferous bed is not far from the surface, as the pits are only from ninety to 400 feet deep. Water is then met with, and either occasions great expense to remove it, or causes the works to be abandoned. This mine was lately 15,747 feet long, and 7217 broad; and if worked by steam-engines, and according to the improved methods practised in Europe, it would be as productive as the celebrated mines of Guanaxuato in Mexico. The annual produce exceeds 131,000 lbs. troy. The mountain of Lauricocha, in which these mines are situated, is about six miles from Pasco, and contains an immense mass of fine porous brown iron-stone, which is interspersed throughout with pure silver, and yields eight or nine marks of the metal for every fifty hundred weight of the ore. There is also a rich vein of friable white metallic argil, which produces from two to ten pounds of silver for every hundred weight. The mines of Choco, in Truxillo, were discovered by Don Rodrigues de Ocano, a European, in 1771; but in the time of the incas the Peruvians obtained metal from this district. The mines in the Partido of Choco, which are included under the appellation of Gualgayoc, have sometimes supplied the provincial treasury of Truxillo with more than 44,000 lbs. troy of pure silver annually. These mines are richer than those of Potosi, and are situated at the height of 13,385 feet above the level of the Pacific Ocean. The mines of Huantajaya, in the partido of Arica, in a desert near the small port of Iquique, are famed for their large portion of native silver. Two pieces were not long since found, the one weighing two, and the other eight quintals. These mines are also surrounded by beds of rock-salt, and their whole annual produce of silver is from 42,000 lbs. to 52,000 lbs. troy. Immense wealth has likewise been discovered in several other places. At Pampa de Navar, wherever the turf is turned up, for more than half a square league, filaments of silver are found adhering to the roots of the grass, and sometimes large pieces of native metal appear. At present most of the Peruvian gold comes from Pataz and Huilies, in Tarmar, where it is met with in veins of quartz, traversing the primitive rock, and from the banks of the Maranon Alto, or higher Maranon, where it is procured by washing the alluvial soil. Emeralds and other precious stones are obtained in various places in this viceroyalty. The annual produce, as estimated from the royal revenues, between 1708 and 1789, was £768,424. The coinage of gold and silver in the royal mint at Lima, from 1791 to 1801, amounted to £1,113,000 per annum, of which 1726 lbs. were gold, and 285,000 lbs. silver.

Among the most valuable animals of these elevated regions are the llama, the guanuco, the vicuna, and the alpaco; which are considered as the camels of America, and are of great use both as beasts of burden, and for their wool.

In the country of Valles, included between the western cordillera and the coast, rain, thunder and lightning are entirely unknown. During the winter, however, which lasts from July to November, the ground is almost constantly covered with a thick fog, which, towards the close of the day, generally dissolves into a very small mist, or dew, and moistens the earth equably. During the summer the sun's rays occasion an intense heat throughout all this region; the more so as they are received upon a sandy soil, whence they are strongly reflected. This low region is far from being healthy; malignant, intermittent, and catarrhal fevers, pleurisies, and constipations, are the most common diseases, and rage constantly at Lima. A great part of Peru, between the western coast of the Andes and the shores of the Pacific, supplies one of the most perfect examples of what is called a hot and dry climate; as for the space of about 400 leagues along the coast, rain is wholly unknown. The Andes intercept the clouds, which pour their contents on the mountain districts, often accompanied by tremendous thunder and lightning, while near the sea not a drop falls to moisten the parched soil. The air in all this tract is, therefore, uniformly hot. During the winter at Lima, Fahrenheit's thermometer never sinks below 60°, and seldom rises above 85°. Vegetation flourishes to the height of 10,000 feet.

The elevated plains between the western and central cordillera, called by Humboldt the high table-land of Peru, has scarcely any variation of temperature throughout the year; the mercury of Fahrenheit's thermometer always standing at about 65° or 66°; the climate is here mild and genial. The only distinction of seasons arises from the rains, which prevail from November till May. The highest Andes are perpetually covered with snow, and experience an uninterrupted winter between the tropics. Here are also many volcanoes which are flaming within, while their summits and all their apertures are clothed with ice.

Peru labors under great disadvantages in regard to inland communication. The deep valleys which separate the elevated plains, and the lofty mountains which rise between the table-land and the coast, render travelling difficult. In many parts there is a total want of roads as well as bridges, and in others the paths lie along the edges of steep and rugged precipices, so narrow that mules alone pass in security. In the most mountainous districts it is customary for those who can afford it to travel on the backs of Indians; in this way they are carried for fifteen or twenty days together. Nor is the Pacific Ocean here favorable to commerce. On the whole extent of its western coast there is no harbour except that of Callao, the port of Lima, which can be entered by a vessel of such a size as is fit for the navigation round Cape Horn. The wind blows constantly from the southward, varying only as the coast tends; wherever, therefore, there is a high projecting headland there is shelter, and sometimes good anchorage to the northward, as at Ylo, Iqueque, &c. But on every part of the shore the swell from the sea causes such a tremendous surf that no communication can be had with the shore by the boats of European ships. The natives pass this surf, on what is called a balsa, constructed of two skins of the largest sized seals, inflated and lashed side by side. The native sits on a small platform fixed between them, with a pipe made of the entrails of the seal, communicating air to each of the inflated skins as he finds it necessary. On these contrivances the natives fear no waves or breakers, and frequently proceed to such a distance as to lose sight of land: sometimes they add a paddle, and occasionally a small sail. Other vessels of this name are used for longer voyages, and consist of an unequal number of trees of light wood, squared, and lashed together, but so loosely as to admit the action of the waves between them. The centre tree is longer than the others, and serves the purpose of a prow. Some of these vessels are more than 100 feet in length, have huts constructed upon them for the crew, and pass with security from the shores of Peru to the ports of Guyaquil and Panama.

The native manufactures of Peru consist of homely articles, such as woollen and cotton cloths of inferior texture. But in dyeing the cloths, whether of woollen or cotton, the natives show ingenuity, and make use of plants scarcely known in Europe. They have a root called reilbon, resembling madder, but with a smaller leaf, an infusion of which makes a fine red. A plant called poquel, a kind of female southern-wood, with green chequered leaves, is used for yellow colors, as is also the stem for dyeing green. A wild indigo yields them a blue dye, and the panque a black. The dress of the natives is simple, consisting of a square cloth, with a hole in the centre, through which the head is thrust, and which falls before and behind. The head is generally covered with a large hat made of the straw of the maize.

The Peruvians were taught by their celebrated Manco to adore the Creator, whom they denominated Paca Camac, that intelligence which animated the world. They seldom built temples, or offered sacrifices to him. One temple, however, dedicated to a kind of unknown god, the Spaniards found at their arrival, erected in a valley, thence named the valley of Paca Camac. The sacrifices instituted in honor of the sun consisted chiefly of lambs; besides which they offered all sorts of cattle, fowls, and corn, and even burnt their finest cloths on the altar by way of incense. They had drink offerings made of maize, steeped in water. They also paid some kind of veneration to the images of several animals and vegetables that had a place in their temples. Besides the solemnities at every full moon, four grand festivals were celebrated annually. The first, called Raymi, was held in June, not only in honor of the sun, but of their first inca, Manca Capac, and Coya Mama Ocla, his wife and sister, whom the incas considered as their first parents, descended immediately from the sun. At this festival all the viceroys, generals, governors, and nobility, assembled at Cuzco, and the inca officiated in person as high-priest: though on other occasions the regular pontiff, who was usually the uncle or brother of the inca, officiated. On the morning of the festival, the inca, accompanied by his near relations, in order of their seniority, went barefoot in procession, at day-break, to the market-place, where they remained looking attentively towards the east. The luminary no sooner appeared than they fell prostrate on their faces in the most profound veneration, and acknowledged it to be their god and father. The vaisal princes and nobility, that were not of the blood royal, did the same in another square. The priests then offered a black lamb, in sacrifice, first turning its head towards the east. From the entrails of the victim they drew prognostics of peace and war, &c. The Peruvians believed in the immortality of the soul. The incas taught them that, on leaving this world, they should enter into a state of happiness, provided for them by their god and father the sun.

Before the arrival of the Spaniards the natives were acquainted with some points of astronomy. They had observed the various motions of the planet Venus, and the different phases of the moon. The people divided the year by the seasons; but the incas, who had discovered the revolution of the sun, marked out the summer and winter solstices by high towers, which they erected on the east and west of Cuzco. When the sun rose directly opposite to four of those towers, on the east side of the city, and set against those of the west, it was then the summer solstice; when it rose and set against the towers, it was the winter solstice. They had also erected marble pillars on the great court before the temple of the sun, by which they observed the equinoxes, under the equator, when the sun being vertical, the pillars cast no shade. At those times they crowned the pillars with garlands of flowers and odoriferous herbs, and celebrated a festival to the sun. They distinguished the months by the moon, and their weeks were called quarters of the moon; the days of the week they distinguished, as first, second, &c. When the sun was eclipsed, they concluded it was on account of their sins, imagining that this phenomenon portended famine, war, and pestilence, or some other terrible calamity. In a similar state of the moon, they apprehended that she was sick and dying.

They had philosophers, who taught morals, cultivated poetry, and composed plays, which were acted before the king by the great men of the court, officers, &c. They were acquainted with painting and statuary; but in all the implements of mechanic arts they were extremely deficient. Though many goldsmiths were constantly employed, they had never invented an anvil of any metal, but used a hard stone, and beat their plate with round pieces of copper instead of hammers; nor had they any files or graving tools. Their carpenters had no other tools than hatchets of copper or flint; nor had they learned the use of iron; though the country affords mines of it. Their knives were also made of flint or copper.

This country was first made known to Europe by the Spanish governor of Santa Maria, in Darien, Nunez de Balboa, who accidentally learned from a young cacique that there was a country abounding with gold about six days' journey to the south. Balboa set out, therefore, on the 1st day of September, 1513, about the time that the periodical rains began to abate. He had only 190 Spaniards along with him; but all of them were veterans, inured to the climate of America, and very much attached to their leader: 1000 Indians attended them, with their fierce dogs, to carry their provisions and other necessaries. After a painful journey of twenty-five days, Balboa arrived at the South Sea; when he went into it up to the middle, and took possession of the coast and ocean in the name of the king of Spain. That part of the South Sea he called the Gulf of St. Michael; a name it still retains. From some of the caciques he extorted provisions and gold; others sent him presents voluntarily. He now led back his followers to Santa Maria, to refresh them, and sent an account to the court of Spain of the important discovery he had made, demanding 1000 men to conquer the new country he had discovered. But the king appointed Pedrarias Davila to supersede him, with the command of fifteen stout vessels and 1200 soldiers. Balboa submitted to the king's pleasure, yet the new governor tried him for some pretended irregularities committed before his arrival, and fined him of almost all he was worth. In the mean time, the Spaniards, paying no regard to the treaties concluded by Balboa with the natives, plundered and destroyed them indiscriminately, from the gulf of Darien to lake Nicaragua. The new comers had also arrived about the middle of the wet season, when the excessive rains produced the most fatal diseases. To this was joined an extreme scarcity of provisions; so that in a month above 600 Spaniards perished. Balboa sent remonstrances to Spain against the new governor; on which the king appointed Balboa to supersede him with very extensive authority; enjoining Pedrarias to support him in all his enterprises. But though a reconciliation took place in appearance, so far that Pedrarias agreed to give his daughter in marriage to Balboa, he soon after had him condemned and executed on pretence of disloyalty. On the death of Balboa, further discoveries were laid aside for some time; but there were three persons at Panama who determined to go in quest of this country. These were Francis Pizarro, Diego de Almagro, and Hernand Luque. We have adverted already to the general history of their proceedings here, but some further particulars will gratify such of our readers as wish to understand the spirit of the Spanish conquests.

Pizarro and Almagro were soldiers of fortune, and Luque was an ecclesiastic, who acted at Panama as a priest and schoolmaster. Their confederacy was authorised by Pedrarias; and each engaged to employ his whole fortune in the adventure. Pizarro, being the least wealthy, engaged to take upon himself the greatest share of the fatigue and danger, and to command the armament. Almagro offered to conduct the supplies of provisions and reinforcements; and Luque was to remain at Panama, to superintend their general interests. In 1524 Pizarro set sail from Panama with a single vessel of small burden, and 112 men, selecting the most improper season of the whole year, i. e. when the periodical winds, which were then set in, were directly opposed to his course. The consequence was, that, after beating about for seventy days, with much danger and fatigue, he had advanced scarcely as far to the south-east as a skilful navigator will now make in three days. He touched at several places of Terra Firma, however, and at the Pearl Islands, where he was found by Almagro, who had set out in quest of him with a reinforcement of seventy men, and had suffered similar distresses. But the country of Popayan, showing a better aspect, and the inhabitants being more friendly, they determined not to abandon their scheme. Almagro returned to Panama, but the bad accounts of the service gave his countrymen such an unfavorable idea of it, that Almagro could levy only eighty men. The disasters and disappointments they met with, in this new attempt, were scarcely inferior to those they had already experienced, when part of the armament at last reached the bay of St. Matthew on the coast of Quito, and landed at Tacamez, where they met with a more fertile country than any they had yet seen; the natives also being more civilised, and clothed in cotton or woollen stuffs, adorned with gold and silver. But some of the adventurers had informed their friends of their many dangers and losses, which weighed so much with Peter de los Rios, the successor of Pedrarias, that he prohibited the raising of new recruits, and even despatched a vessel to bring home Pizarro and his companions from Gallo. Almagro and Luque advised Pizarro not to relinquish an enterprise on which they had built all their hopes. He therefore refused to obey the governor's orders, and entreated his men not to abandon him. But the calamities to which they had been exposed had such an effect, that when he drew a line upon the sand with his sword, telling such as wished to return, that they might pass over it, only thirteen remained with him. Pizarro with his little troop now fixed their residence on the island of Gorgona, where they continued five months, in the most unwholesome climate, when a vessel arrived from Panama, Almagro and Luque having prevailed on the governor to send them relief. He now therefore sailed to the south-east, and in twenty days landed on the coast of Peru, at Tumbez, remarkable for its stately temple, and a palace of the incas or sovereigns of the country. Here they found the reports concerning the riches of the country were true; not only ornaments and sacred vessels being made of gold and silver, but even such as were for common use. Yet to attempt the conquest of this opulent empire with their slender force would have been madness; they contented themselves with viewing it, procuring two of the beasts called Llamas, some vessels of gold and silver, and two young men, whom they instructed in the Castilian language. With these Pizarro arrived at Panama in 1527.

Huana Capac, the twelfth monarch from the founder of the native empire, was at this time on the throne; a prince no less conspicuous for his abilities in war than for his pacific virtues. By him the kingdom of Quito was subdued, which almost doubled the extent of the Peruvian empire. Huana married the daughter of the conquered monarch, by whom he had a son named Atahualpa, or Atabalipa, to whom, at his death in 1529, he left the kingdom of Quito, bestowing the rest of his dominions on Huascar, his eldest son, by a mother of the royal race. This produced a civil war, in which Atabalipa proved victorious, and afterwards, to secure himself on the throne, put to death all the descendants of Manco; but he spared the life of his rival Huascar, who was taken prisoner, that, by issuing orders in his name, he might establish his own authority. This contest had now so much engaged the attention of the Peruvians, that, on the return of the Spaniards, they never attempted to check their progress. The first intelligence Pizarro received of it was a message from Huascar, asking his assistance against Atabalipa. Pizarro, therefore, determined to push forward, while intestine discord put it out of the power of the Peruvians to attack him with their whole force. Leaving a garrison in St. Michael, he began his march with only sixty-two horsemen, and 102 foot. He proceeded to Caxamalca, where Atabalipa was encamped, and was met by an officer with a valuable present from the Inca, accompanied with a proffer of his alliance. Pizarro pretended to come as the ambassador of a very powerful monarch, who wished to aid him against his enemies. As the object of the Spaniards in entering their country was otherwise altogether incomprehensible, the Peruvians had formed various conjectures concerning it. Pizarro's declarations of his pacific intentions, now, therefore, removed all the Inca's fears. The Spaniards were thus allowed to march across the sandy desert between St. Michael and Motupe, and through a defile in the mountains so narrow and inaccessible that a few men might have defended it. As they approached to Caxamalca, Atabalipa sent them presents of still greater value. On entering Caxamalca, Pizarro took possession of a large court, on one side of which was a palace of the Inca, and on the other a temple of the sun, surrounded with a strong rampart. When he had posted his troops in this advantageous station, he despatched Hernando Soto, and his brother Ferdinand, to the camp of the Inca, to desire an interview. Here they were treated with respectful hospitality, and Atabalipa promised to visit the Spanish commander next day. The decent deportment of the Peruvian monarch, the order of his court, and the reverence with which his subjects obeyed his commands, astonished the Spaniards. But their eyes were more powerfully attracted by the vast profusion of wealth which they observed. On their return to Caxamalca, they gave such a description of it as confirmed Pizarro in a resolution which he had already taken, as daring as it was perfidious. He determined to avail himself of Atabalipa's unsuspicious simplicity, to seize his person. Dividing his cavalry, therefore, into three squadrons, under his brothers Ferdinand, Soto, and Benalcazzar; and forming his infantry into one body, except twenty of his tried courage, whom he kept near his own person; he placed his artillery, consisting of two field-pieces, and the cross-bow men, opposite to the avenue by which Atabalipa was to approach. Early in the morning, the Peruvian camp was in motion. But as Atabalipa was solicitous to appear with the greatest splendor and magnificence in his first interview with the strangers, the day was far advanced before he began his march. At length the inca approached. First appeared 400 men in uniform, as harbingers. He himself sitting on a throne, almost covered with gold, silver, and precious stones, was carried on the shoulders of his principal attendants. Behind him came his chief officers. Several bands of singers and dancers accompanied the cavalcade; and the whole plain was covered with troops amounting to about 30,000 men. As the inca drew near the Spanish quarters, father Vincent Valverede, chaplain to the expedition, advanced with a crucifix in one hand, and a breviary in the other, and in a long discourse pretended to announce the true doctrine of the creation, the fall of Adam, the incarnation, the sufferings and resurrection of Jesus Christ, the appointment of St. Peter as God's vicegerent on earth, the transmission of his apostolic power by succession to the popes, and the donation made to the king of Castile by pope Alexander of all the regions in the New World. In conclusion he required Atabalipa to embrace the Christian faith, to acknowledge the jurisdiction of the pope, and to submit to the king of Castile as his lawful sovereign; promising, if he complied, that the Castilian monarch would protect his dominions, and permit him to continue in his authority; but, if he should impiously refuse to obey this summons, he denounced war against him in his master's name. This strange harangue, unfolding deep mysteries, and alluding to unknown facts, of which no power of eloquence could have conveyed a distinct idea to an American, was so lamely translated by an unskilful interpreter, that it was incomprehensible to Atabalipa. But some parts in it, of obvious meaning, filled him with astonishment and indignation. His reply, however, was temperate. He said that he was lord of his own dominions by hereditary right; that he could not conceive how a foreign priest should pretend to dispose of territories which did not belong to him: that he, being the rightful possessor, refused to confirm it; that he would not forsake the service of the Sun, the immortal divinity whom he revered, to worship the God of the Spaniards, who was subject to death; that with respect to other matters, as he had never heard of them before, he desired to know where he had learned things so extraordinary. 'In this book,' answered Valverede, reaching out to him his breviary. The inca opened it, and turning over the leaves, lifted it to his ear: 'This,' says he, 'is silent; it tells me nothing;' and threw it with disdain to the ground. The enraged monk, running to his countrymen, cried out, 'To arms, Christians, to arms! the word of God is insulted! avenge this profanation on these impious dogs.' Pizarro immediately gave the signal of assault. At once the martial music struck up, the cannon and muskets began to fire, the horse sallied out fiercely, the infantry rushed on, sword in hand. The Peruvians, astonished at the unexpected attack, fled with universal consternation, without attempting to defend themselves. Pizarro, at the head of his chosen band, advanced directly towards the inca; and though his nobles crowded around him with zeal, and fell in numbers at his feet, the Spaniards soon penetrated to the royal seat; and Pizarro, seizing the inca by the arm, dragged him to the ground, and carried him a prisoner to his quarters. The fate of the monarch increased the precipitate flight of his followers. The Spaniards pursued them towards every quarter, and, with deliberate and unrelenting barbarity, continued to slaughter the wretched unresisting fugitives. Above 4000 Peruvians were killed. Not a single Spaniard fell, we are told, nor was one wounded but Pizarro himself slightly. The plunder taken was immense, but the Spaniards were still unsatisfied; which being observed by the inca, he endeavoured to apply himself to their ruling passion, avarice, to obtain his liberty; and, therefore, offered such a ransom as quite astonished them. The apartment in which he was confined was twenty-two feet in length, and sixteen in breadth; all this space he engaged to fill with vessels of gold as high as he could reach. The proposal was eagerly caught by Pizarro, and a line was drawn upon the walls to mark the stipulated height.

Atabalipa, anxious for his liberty, immediately despatched messengers into all parts of the empire, to collect the quantity of gold which he had promised; and, though the unfortunate monarch was now in the hands of his enemies, such was the veneration which his subjects had for him, that his orders were obeyed with as great alacrity as if he had been at full liberty. In a short time Pizarro received intelligence that Almagro was arrived at St. Michael with a reinforcement. This was a matter of no small vexation to Atabalipa, who now considered his kingdom as in danger of being totally overrun by these strangers. For this reason he ordered his brother Huascar to be put to death, lest he should join against him. In the mean time, the Indians daily arrived at Caxamalca with vast quantities of treasure; the sight of which so much inflamed the Spaniards, that they insisted upon an immediate division: and this being complied with, there fell to the share of each horseman 8000 pesos, worth as many pounds sterling, and half as much to each foot soldier, Pizarro and his officers receiving shares proportionable to their dignity. A fifth part was reserved for the emperor, together with some vessels of curious workmanship. After this, Atabalipa was very importunate with Pizarro to recover his liberty; but the Spaniard, with unparalleled treachery and cruelty, had now determined to put him to death. But, to give some show of justice to this detestable action, Pizarro instituted a court of judicature for trying him. He appointed himself and Almagro, with two assistants, as judges; an attorney-general to carry on the prosecution in the king's name; counsellors to assist the prisoner in his defence; and clerks to record the proceedings. Before this strange tribunal, a charge was exhibited still more amazing. That Atabalipa, though a bastard, had usurped the royal power; that he had put his brother and lawful sovereign to death; that he was an idolater, and had offered up human sacrifices; that he had a great number of concubines, &c. On these heads they proceeded to try the sovereign of a great empire, over whom they had no jurisdiction. To all these charges the inca pleaded not guilty. He called heaven and earth to witness the integrity of his conduct, and how faithfully he performed his engagements, and the perfidity of his accusers. He desired to be sent over to Spain, to take his trial before the emperor: but no regard was paid to his entreaties. He was condemned to be burnt alive; which cruel sentence was mitigated to strangling; and the unhappy monarch was executed without mercy. Hideous cries were set up by his women as the funeral procession passed by their apartment; many offered to bury themselves alive with him; and, on being hindered, strangled themselves out of grief. The whole town of Caxamalca was filled with lamentations, which quickly extended over the whole kingdom.

Yet this murder of Atabalipa did no service to the Spaniards. Friends and enemies accused them of inhumanity and treachery. Loads of gold that were coming to Caxamalca by order of the deceased inca were now stopped; this was the first consequence of their late iniquitous conduct. The two factions of Indians also united against Pizarro; and many of the Spaniards not only exclaimed against the cruelty of the judges, but would even have mutinied, had not a sense of the impending danger kept them quiet. At Cuzco the friends of Huascar proclaimed Mango Capac, the legitimate brother of the late inca: on which Pizarro set up Taparpa, the son of Atabalipa. Immediately he set out for Cuzco. An army of Indians opposed his progress, but the Spanish cavalry bore down every thing before them. The conquerors gained a great booty; and Pizarro despatched Almagro to reduce Cuzco, while he himself founded a new colony in Xauna. Ferdinand Soto was detached with sixty horse to Cuzco, to clear the road for the remainder of the army. Meantime Taparpa died; and, as the Spaniards set up no person in his room, the title of Manco Capac was universally acknowledged. A new supply of soldiers arriving from Spain, Benalcazar, governor of St. Michael, undertook an expedition against Quito, where Atabalipa had left the greatest part of his treasure. He accomplished his purpose with difficulty, but found that the inhabitants had carried off all their gold and silver. About the same time Alvarado, governor of Guatimala, invaded Chili. In this expedition his troops endured such hardships, and suffered so much from the cold among the Andes, that a fifth part of the men and all the horses died, and the rest were so much dispirited and emaciated that they became quite unfit for service. Alvarado then returned to his government, but most of his followers enlisted under Pizarro. In the mean time Ferdinand Pizarro had landed in Spain, where he produced such immense quantities of gold and silver as astonished the court. The general's authority was confirmed with new powers; Almagro had the title of governor conferred upon him, with jurisdiction over 200 leagues of a country lying south of the province allotted to Pizarro. Pizarro then settled the internal policy of his province, and removed the seat of government from Cuzco to Lima.

Meantime Almagro had set out on his expedition to Chili. Pizarro encouraged his most distinguished officers to invade those provinces which had not yet been visited by the Spaniards. No sooner did Manco Capac perceive the Spaniards thus dividing their forces, than he seized the opportunity of making one vigorous effort to redress the wrongs of his countrymen, and expel the cruel invaders. Though strictly guarded by the Spaniards, he found means to communicate his intentions to the chief men of his nation, whom he joined in 1536, under pretence of celebrating a festival which he had obtained liberty from Pizarro to attend. Upon this an army of 200,000 men collected. Many Spaniards were massacred, and several detachments cut off: while this vast army laid siege to Cuzco, another formidable body invested Lima, and kept the governor shut up. The greatest effort, however, was made agaist Cuzco, which was defended by Pizarro and his two brothers, with only 170 men. The siege lasted nine months; many Spaniards were killed; among whom was John Pizarro, the general's brother. The rest were reduced to the most desperate situation, when Almagro appeared near Cuzco. He had now received the royal patent, creating him governor of Chili. On his arrival, his assistance was solicited by both parties. The inca made many advantageous proposals; but at length attacked him in the night by surprise. But the Spanish valor and discipline prevailed, and the Peruvians were repulsed with such slaughter that the remainder dispersed, and Almagro advanced to Cuzco. Pizarro's brother took measures to oppose his entrance; but, while prudence restrained both parties from entering into a civil war, each leader endeavoured to corrupt the followers of his antagonist. In this Almagro had the advantage; and so many of Pizarro's troops deserted in the night that Almagro was encouraged to advance towards the city, where he surprised the sentinels; and, investing the house where the two brothers were lodged, he compelled them, after an obstinate defence, to surrender. Almagro's authority over Cuzco was now immediately recognised. But Francis Pizarro having dispersed the Peruvians who invested Lima, and received considerable reinforcements from other provinces, ordered 500 men, under Alonso de Alvarado, to march to Cuzco to relieve his brothers. Almagro attacked him by surprise, defeated and dispersed his army, taking himself and some of his principal officers prisoners. This victory seemed decisive: and Almagro was advised to make it so by putting to death Gonzalo and Ferdinand Pizarro, and Alvarado. This advice, however, he declined from humanity; and, instead of marching directly against Pizarro, he retired to Cuzco, which gave his adversary time to recollect himself, and Almagro again suffered himself to be deceived by pretended offers of pacification. The negociations were protracted for several months; Gonzalo Pizarro and Alvarado bribed the soldiers who guarded them, and escaped with sixty of Almagro's men. The general next proposed that all disputes should be submitted to their sovereign; and, on this principle, Almagro released those whom Pizarro wanted; which he had no sooner done, than the latter set out for Cuzco with an army of 700 men, to which Almagro had only 500 to oppose. He advanced without obstruction, and an engagement soon followed, in which Almagro was defeated and taken prisoner. The conquerors behaved with great cruelty, massacring a great number of officers. The Indians had assembled in great numbers to see the battle, with an intention to join the vanquished; but were so much overawed by the Spaniards that they retired after the battle was over, and thus lost the only opportunity they ever had of expelling their tyrants.

Almagro was at length tried and condemned by Pizarro; and he was first strangled in prison, and then beheaded. He left one son by an Indian woman, whom he appointed his successor. As during these dissensions all intercourse with Spain ceased, it was some time before the accounts of the civil war were received at court. The first intelligence was given by some of Almagro's soldiers, who had left America on the ruin of their cause; and they did not fail to represent the injustice and violence of Pizarro in their proper colors, which strongly prejudiced the emperor against him. In a short time, however, Ferdinand Pizarro arrived, and endeavoured to give matters a new turn. The emperor was uncertain which of them to believe, but resolved to send over one he could trust to investigate the matter. Meantime Ferdinand was arrested at Madrid, and confined to prison, where he remained twenty years. The person nominated to this important trust was Christopher Vaca Di Castro. While Di Castro was preparing for his voyage, Pizarro, considering himself as the unrivalled master of Peru, proceeded to parcel out its territories among the conquerors; and, had this division been made with any degree of impartiality, the extent of country which he had to bestow was sufficient to have gratified his friends, and to have gained his enemies. But Pizarro conducted this transaction with the illiberal spirit of a party-leader. Large districts, in parts of the country most cultivated and populous, were set apart as his own property, or granted to his brothers, his adherents and favorites. To others, lots less valuable and inviting were assigned. The followers of Almagro, amongst whom were many of the original adventurers to whose valor Pizarro was indebted for his success, were totally excluded. They therefore murmured in secret, and meditated revenge.

Rapid as the progress of the Spaniards in South America had been since Pizarro landed in Peru, their avidity of dominion was not yet satiated. The officers to whom Ferdinand Pizarro gave the command of different detachments penetrated into several new provinces; and though exposed to great hardships in the cold regions of the Andes, and amidst the woods and marshes, they made considerable discoveries and conquests. Peter de Valdivia re-assumed Almagro's scheme of invading Chili; and made such progress in the conquest of the country, hat he founded the city of St. Jago. But the enterprise of Gonzales Pizarro was the most remarkable. He set out from Quito at the head of 340 soldiers, nearly one-half of whom were horsemen, with 4000 Indians. Excess of cold and fatigue proved fatal to the greater part of these last. The Spaniards, though more robust, suffered considerably; but, when they descended into the low country, their distress increased. During two months it rained incessantly, without any interval of fair weather to dry their clothes. The vast plains upon which they were now entering, either without inhabitants, or occupied by the rudest and least industrious tribes in the New World, yielded little subsistence. They could not advance a step but through woods or marshes. Such incessant toil, and scarcity of food, would have dispirited any troops. But the fortitude and perseverance of the Spaniards were insuperable. They persisted in struggling on, until they reached the banks of the Napo, one of the large rivers which run into the Maragnon. There, with infinite labor, they built a bark, which was manned with fifty soldiers, under Francis Orellana. The stream carried them down with such rapidity that they were soon far a-head of their countrymen, who followed slowly by land. At this distance from his commander, Orellana formed the scheme of distinguishing himself, by following the course of the Maragnon until it joined the ocean, and by surveying the vast regions through which it flows. This scheme was as bold as it was treacherous. For, if he violated his duty to his commander, and abandoned his fellow soldiers in a pathless desert, his crime is somewhat balanced by the glory of having ventured upon a navigation of nearly 2000 leagues, through unknown nations, in a vessel hastily constructed with green timber, and by very unskilful hands, without provisons, without a compass, or a pilot. But his courage and alacrity supplied every defect. Committing himself fearlessly to the guidance of the stream, the Napo bore him along to the south until he reached the great channel of the Maragnon. He sometimes seized by force the provisions of the fierce savages seated on its banks, and sometimes procured a supply of food by a friendly intercourse. After a long series of dangers and distresses, which he encountered with amazing magnanimity, he reached the ocean, where new perils awaited him. These he likewise surmounted, and got safe to the Spanish settlements in the island of Cubagua; whence he sailed to Spain.

The vanity natural to travellers who visit regions unknown to the rest of mankind prompted him to mingle an extraordinary proportion of the marvellous in the narrative of his voyage. He pretended to have discovered nations so rich that the roofs of their temples were covered with plates of gold; and described a republic of Amazons so warlike and powerful as to have extended their dominion over a considerable tract of the fertile plains which he had visited; fables hardly yet exploded. The voyage, however, deserves to be recorded, not only as one of the most memorable occurrences in that adventurous age, but as the first event that led to any certain knowledge of those immense regions that stretch east from the Andes to the ocean. No words can describe the consternation of Pizarro, when he did not find the bark at the confluence of the Napo and Maragnon, where he had ordered Orellana to wait for him. But, imputing his absense from the place of rendezvous to some unknown accident, he advanced above fifty leagues along the banks of the Maragnon, expecting every moment to see the bark appear with a supply of provisions. At length he came up with an officer whom Orellana had left to perish in the desert, because he had remonstrated against his perfidy. From him he learned the extent of Orellana's crime; and his followers perceived at once their own desperate situation. The spirit of the stoutest hearted veteran sank within him; and all demanded to be led back instantly. Pizarro was now 1200 miles from Quito; and in that long march the Spaniards encountered hardships greater than those they had endured in their progress outward. Hunger compelled them to feed on roots and berries, to eat all their dogs and horses, to devour the most loathsome reptiles, and even to gnaw the leather of their saddles and sword belts: 4000 Indians, and 210 Spaniards, perished in this wild and disastrous expedition, which continued nearly two years; and, as fifty men were aboard the bark with Orellana, only eighty got back to Quito. These were naked like savages, and so emaciated with famine or worn out with fatigue, that they had more the appearance of spectres than of men. But Pizarro, on entering Quito, received accounts of a state of things that threatened calamities more dreadful than those through which he had passed. From the time that his brother made the partial division of his conquests above-mentioned, the adherents of Almagro no longer entertained any hope of bettering their condition. Great numbers in despair resorted to Lima, where the house of young Almagro was always open to them: and the slender portion of his father's fortune, which he enjoyed, was spent in affording them subsistence. The warm attachment with which

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every person who had served under the elder Almagro devoted himself to his interests, was transferred to his son, who was now grown up to manhood, and possessed all the qualities which captivate the affections of soldiers. Of a graceful appearance, dexterous at all martial exercises, bold, open, generous, he seemed to be formed for command; and the accomplishments he had acquired heightened the respect of his followers. The Almagrians, looking up to him as their head, were ready to undertake any thing for his advancement. Nor was affection for Almagro their only incitement; they were urged on by their own distresses. Many of them, destitute of common necessaries, and weary of loitering away life, a burden to their chief, began to deliberate how they might be avenged on the author of all their misery. Their frequent cabals did not pass unobserved; and the governor was warned to be on his guard against men who meditated some desperate deed, and had resolution to execute it. But either from his native intrepidity, or from contempt of persons whose poverty rendered their machinations of little consequence, he disregarded the admonitions of his friends. This gave the Almagrians full leisure to digest and ripen their scheme; and John de Herrada, an officer of great abilities, who had the charge of Almagro's education, took the lead in their consultations. On Sunday the 26th of June, at mid-day, Herrada, at the head of eighteen of the most determined conspirators, sallied out of Almagro's house in armour; and drawing their swords, as they advanced hastily towards the governor's palace, cried out, 'Long live the king, but let the tyrant die.' Though Pizarro was usually surrounded by a numerous train of attendants, yet, as he was just risen from table, and most of his domestics had retired to their own apartments, the conspirators were at the bottom of the staircase before a page in waiting could give the alarm. The governor, whom no form of danger could appal, starting up, called for arms, and commanded Francis de Chaves to make fast the door. But that officer, running to the top of the staircase, wildly asked the conspirators what they meant? Instead of answering, they stabbed him to the heart, and burst into the hall. A few, drawing their swords, followed Pizarro into an inner apartment. The conspirators rushed forward after them. Pizarro, with no other arms than his sword and buckler, defended the entry, and, supported by his half-brother Alcantara and his friends, maintained the unequal contest with the vigor of a youthful combatant. But the armor of the conspirators protected them, while every thrust they made took effect. Alcantara fell dead at his brother's feet; his other defendants were mortally wounded; and the governor, no longer able to parry the many weapons furiously aimed at him, received a deadly thrust full in his throat, sunk, and expired. As soon as he was slain, the assassins ran out into the streets, and waving their bloody swords, proclaimed the death of the tyrant. Above 200 of their associates having joined them, they conducted young Almagro in solemn procession through the city; and, assembling the magistrates and principal citizens, compelled them to acknowledge him as lawful successor to his father in his government. The palace of Pizarro, and the houses of his adherents, were pillaged by the soldiers. The new governor marched into the heart of the empire to reduce such places as refused to acknowledge his authority. A multitude of ruffians joined him on his march. His army breathed nothing but vengeance and plunder; every thing gave way before it. If the military talents of the general had equalled the ardor of his troops, the war had ended here. Unhappily for Almagro, he had lost his conductor John de Herrada. His inexperience made him fall into the snares that were laid for him by Peter Alvares, who had put himself at the head of the opposite party. In the mean time, Vaca Di Castro, who had been sent from Europe to try the murderers of old Almagro, arrived at Peru. As he was appointed to assume the government in case Pizarro was no more, all who had not sold themselves to the tyrant, hastened to acknowledge him. Castro instantly led them against the enemy. The armies engaged at Chapas on the 16th of September, 1542, and fought with inexpressible obstinacy. Victory decided in favor of Castro. Those among the rebels who were most guilty, dreading torture, provoked the conquerors to murder them, crying out, It was I who killed Pizarro. Their chief was taken prisoner and died on the scaffold.

While these scenes of horror were transacting in America, the Spaniards in Europe were employed in finding out expedients to terminate them; though no measures had been taken to prevent them. Peru had only been made subject to the audience of Panama, which was too remote. A supreme tribunal was established at Lima for the dispensation of justice, with authority to enforce and reward a due obedience to the laws. Blasco Nunez Vela, who presided in it as viceroy, arrived in 1544, attended by his subordinates in office, and found every thing in the most dreadful disorder. To put an end to the tumults which now subsisted would have required a profound genius, and many other qualities which are seldom united. Nunez had none of these advantages. He indeed possessed probity, firmness, and ardor. With these virtues, which were almost defects in his situation, he began to fulfil his commission, without regard to places, persons, or circumstances. Contrary to the opinion of all intelligent persons, who wished that he should wait for fresh instructions from Europe, he published ordinances, which declared that the lands the conquerors had seized should not pass to their descendants, and which dispossessed those who had taken part in the civil commotions. All the Peruvians who had been enslaved by monks, bishops, and persons belonging to the government were declared free. Other tyrannical establishments also would soon have been proscribed; and the conquered people were on the eve of being sheltered under the protection of laws which would at least have tempered the rigors of the right of conquest, if even they had not entirely repaired the injustice of them; but the Spanish government was to be unfortunate even in the good it attempted to effect. A change so unexpected filled those with consternation who saw their fortunes thus wrested from them. From astonishment they proceeded to indignation, murmuring, and sedition. The viceroy was degraded, put in irons, and banished to a desert island, till he could be conveyed to Spain. Gonzales Pizarro was then returned from his hazardous expedition, which had employed him long enough to prevent him from taking a part in those revolutions which had so rapidly succeeded each other. The anarchy he found prevailing at his return inspired him with the idea of seizing the supreme authority. His fame and his forces made it impossible that this should be refused him; but his usurpation was marked with so many enormities that Nunez was regretted. He was recalled from exile, and soon collected a sufficient number of forces to enable him to take the field. Civil commotions were then renewed with extreme fury by both parties. No quarter was asked or given on either side. The Indians took part in this as they had done in the preceding wars; some ranged themselves under the standard of the viceroy, others under the banners of Gonzales. From 15,000 to 20,000 of these unhappy wretches, who were scattered about in each army, dragged up the artillery, levelled the roads, carried the baggage, and destroyed one another. Their conquerors had taught them to be sanguinary. After a variety of advantages for a long time alternately obtained, fortune at length favored the rebellion under the walls of Quito, in January, 1545; and Nunez with the greatest part of his men were massacred. Pizarro took the road of Lima, where they were deliberating on the ceremonies with which they should receive him. Gonzales contented himself with making his entrance on horseback, preceded by his lieutenant, who marched on foot. Four bishops and the magistrates accompanied him. The streets were strewn with flowers, and the air resounded with music. This homage totally turned the head of a man naturally haughty, and of confined ideas. Had Gonzales possessed both judgment and moderation, he might have rendered himself independent. The principal persons of his party wished it. Instead of this, he acted with blind cruelty, insatiable avarice, and unbounded pride. Even they whose interests were connected with those of the tyrant wished for a deliverer. Such a deliverer arrived from Europe in the person of Peter Di la Gasca. The squadron and the provinces of the mountains immediately declared for a person who was invested with a lawful authority to govern them. Those who had lived concealed in deserts, caverns, and forests, joined him. Gonzales met the royal army, and attacked it in the spring of 1548. One of his lieutenants, seeing him abandoned at the first charge by his best soldiers, advised him to throw himself into the enemy's battalions, and perish like a Roman; but this weak man chose rather to surrender, and end his life on a scaffold; Carvajal, a more able warrior, and more ferocious than himself, was quartered. This man, when he was expiring, boasted that he had massacred with his own hands 1400 Spaniards and 20,000 Indians. Such was the last scene of a tragedy of which every act had been marked with blood. The government was moderate enough not to continue the proscriptions; and the remembrance of the horrid calamities they had suffered kept the Spaniards in subjection. The commotion insensibly sunk into a calm; and the country remained quiet from this time for three centuries. With regard to the Peruvians, the most cruel measures were taken to render it impossible for them to rebel. Tupac Amaru, the heir of their last king, had taken refuge in some remote mountains, where he lived in peace. There he was so closely surrounded by the troops sent out against him that he was forced to surrender. The viceroy Francis de Toledo caused him to be accused of several pretended crimes, and he was beheaded in 1571. All the other descendants of the incas shared a similar fate. The horror of these enormities excited so universal an indignation, both in the Old and the New World, that Philip II. disavowed them; but the infamous policy of this prince was so notorious that no credit was given to this pretence to justice and humanity. Only one attempt was afterwards made by the Peruvians to recover their independence, and throw off the Spanish yoke: that which we have noticed as taking place in 1782.

Peru, a township of the United States, in Bennington county, Vermont.—2. A township of the United States, in Berks county, Massachusetts.—3. A township of the United States, in Clinton county, New York, on Lake Champlain, 140 miles north of Albany.

Peru, Balsam of. A substance obtained from the myroxylon peruiferum, which grows in the warm parts of South America. The tree is full of resin, and the balsam is obtained by boiling the twigs in water. It has the consistency of honey, a brown color, an agreeable smell, and a hot acrid taste.

PERVADE', *v. a.* } Lat. *pervado*. To pass
Perva'sion, *n. s.* } through an aperture; to permeate: the act of passing through.

If fusion be made rather by the ingress and transcursions of the atoms of fire, than by the bare propagation of that motion, with which fire beats upon the outsides of the vessels, that contain the matter to be melted; both those kinds of fluidity, ascribed to saltpetre, will appear to be caused by the *pervasion* of a foreign body. *Boyle.*

Paper dipped in water or oil, the oculus mundi stone steeped in water, linen cloth oiled or varnished, and many other substances soaked in such liquors as will intimately *pervade* their little pores, become by that means more transparent than otherwise. *Newton.*

The laboured chyle *pervades* the pores
In all the arterial perforated shores. *Blackmore.*

Matter, once bereaved of motion, cannot of itself acquire it again, nor till it be struck by some other body from without, or be intrinsically moved by an immaterial self-active substance, that can penetrate and *pervade* it. *Bentley.*

What but God,
Pervades, adjusts and agitates the whole? *Thomson.*

PERVENCHERES, a town in the north of France, department of the Orne, with 800 inhabitants. Nine miles south-west of Mortagne, and fourteen north-east of Alençon.

PERVERSE', *adj.*
PERVERSE'LY, *adv.*
PERVERSE'NESS, *n. s.*
PERVER'SION,
PERVER'SITY,
PERVERT', *v. a.*
PERVER'TER, *n. s.*
PERVER'TIBLE, *adj.*

Fr. *pervers;* Ital. Span. and Pers. *perverso;* Lat. *perversus.* Distorted; froward; untractable; petulant; obstinate: perversely and perverseness follow these senses: perversion is used for both the act of perverting and the state of being perverted: perversity is synonymous with perverseness: to pervert is to distort; corrupt; turn from the right; opposed to convert, which is to turn from the wrong: pervertible is apt or easy to be perverted.

Perverse lips put far from thee. *Prov.* iv. 24.

If thou seest the oppression of the poor, and violent *perverting* of justice in a province, marvel not. *Ecclus.* v. 8.

Wilt thou not cease to *pervert* the right ways of the Lord? *Acts.* xiii. 10.

Instead of good they may work ill, and *pervert* justice to extreme injustice. *Spenser's State of Ireland.*

O gentle Romeo,
If thou dost love, pronounce it faithfully;
Or if you think I am too quickly won,
I'll frown and be *perverse*, and say thee nay,
So thou wilt wooe: but else not for the world. *Shakspeare.*

Neither can this be meant of evil governours or tyrants; for they are often established as lawful potentates; but of some *perverseness* and defection in the nation itself. *Bacon.*

Women to govern men, slaves freemen, are much in the same degree; all being total violations and *perversions* of the laws of nature and nations. *Id.*

Virtue hath some *perverseness*; for she will
Neither believe her good, nor others ill. *Donne.*

Men *perversely* take up piques and displeasures at others, and then every opinion of the disliked person must partake of his fate. *Decay of Piety.*

And nature breeds
Perverse, all monstrous, all prodigious things. *Milton.*

If then his providence
Out of our evil seek to bring forth good,
Our labour must be to *pervert* that end,
And out of good still to find means of evil. *Id.*
Her whom he wishes most, shall seldom gain
Through her *perverseness;* but shall see her gained
By a far worse. *Id. Paradise Lost.*

The heinous and despiteful act
Of Satan, done in Paradise, and how
He in the serpent had *perverted* Eve,
Her husband she, to taste the fatal fruit,
Was known in heaven. *Id.*

The apostles, who sometimes inveigh so zealously against the opposers and *perverters* of truth, did in their private conversation and demeanour strictly observe their own rules of abstinence from reproach. *Barrow.*

He that reads a prohibition in a divine law, had need be well satisfied about the sense he gives it, lest he incur the wrath of God, and be found a *perverter* of his law. *Stillingfleet.*

To so *perverse* a sex all grace is vain,
It gives them courage to offend again. *Dryden.*
The *perverseness* of my fate is such,
That he's not mine, because he's mine too much. *Id.*

He has *perverted* my meaning by his glosses; and interpreted my words into blasphemy, of which they were not guilty. *Id.*

Men that do not *perversely* use their words, on purpose set themselves to cavil, seldom mistake the signification of the names of simple ideas. *Locke.*

What strange *perversity* is this of man!
When 'twas a crime to taste the' enlight'ning tree,
He could not then his hand refrain. *Norris.*

Where a child finds his own parents his *perverters*, he cannot be so properly born, as damned into the world. *South.*

The subtle practices of Eudoxius, bishop of Constantinople, in *perverting* and corrupting the most pious emperor Valens. *Waterland.*

A patriot is a dangerous post,
When wanted by his country most,
Perversely comes in evil times,
Where virtues are imputed crimes. *Swift.*

He supposes that whole reverend body are so far from disliking popery, that the hopes of enjoying the abbey lands would be an effectual incitement to their *perversion*. *Id.*

Porphyry has wrote a volume to explain this one of the nymphs with more piety than judgment; and another person has *perverted* it into obscenity; and both allegorically. *Broome.*

We cannot charge any thing upon their nature, till we take care that it is *perverted* by their education. *Law.*

PERUGIA, the ancient Lacus Thrasymenus, one of the most considerable lakes in the central part of Italy, remarkable for the victory gained by Hannibal over the Romans, commanded by Flaminius. The scenery of its banks is very picturesque.

PERUGIA, a province of Italy, in the States of the Church, includes the ci-devant Perugino, and contains 182,000 inhabitants. It is a district of great fertility, and is watered by the Tiber and some smaller streams, together with the lake of this name.

PERUGIA, a large town of the central part of Italy, in the States of the Church, the capital of the province of this name, stands on the summit of a high hill near the Tiber; about eighty-five miles north of Rome, and thirty N. N. W. of Spoleto. It has a citadel and fortifications, but is a place of far more beauty than strength. It is the see of a bishop, and contains 16,000 inhabitants. The cathedral is an indifferent building, both in its architecture and decorations; but some of the churches, particularly that of St. Peter, belonging to a Benedictine abbey, are splendidly ornamented. This is supported by eighteen pillars of fine marble, and adorned with rich marble altars. The most interesting objects in the town are a number of valuable paintings in the churches and private collections by the celebrated Pietro Perugino (a native of this place), and by his more celebrated pupil Raphael. Here is a town-house, a small university, and several hospitals. The gate of the Piazza Grimani is of the Roman architecture. The town has also manufactures of velvet, silks, oil, and brandy.

PERUGINO (Pietro Vannucci, Il), was born at Citta della Pieve, near Perugia, in 1446. His parents, being in low circumstances, placed him at first with an inferior painter, who, however, had discretion enough to animate his pupil with an enthusiastic attachment to his profession. At this period the fine arts were cultivated, and flourished eminently at Florence; which induced

Perugino to seek for instruction in that city, where, according to the most common accounts, he had Andrea Verocchio for his instructor, but others allege, that he never had any other master than Benedetto Bonfigli of Perugia. His first work of reputation was a picture of St. Jerom contemplating a crucifix; in which the figure of the saint appeared so mortified and emaciated, as if designed after a living model. His next was a Descent from the Cross, painted for the church of St. Chiara, at Florence. In this picture the coloring is beautiful, and the air of the Virgin eminently distinguished. In one part of the design, he introduced an admirable landscape. A Florentine merchant offered treble the sum that had been paid for it, but the proposal was rejected, because Perugino declared himself incapable of finishing another so well. The celebrity he thus acquired procured him an invitation from pope Sixtus IV. to visit Rome, where he executed several works for that pontiff's chapel. On his return to Florence, where Michel Angelo Buonaroti was at that time in high esteem, he quarrelled with that great man, and was so severely satirised by the poets as to be obliged to retire to his native place. Perugino's pencil is light, and he finished his pictures highly; but his manner was dry and stiff, and his outline often incorrect. His highest honor consisted in being the instructor of Raffaelle; who, with his father Giovanni, assisted him in many of his works. Vasari recites the following story of this artist:—The monks of a monastery at Florence had engaged Perugino to paint in fresco a piece of sacred history; and the prior, who had agreed to supply the ultramarine for the work, being of a suspicious disposition, always attended while it was used, lest some of it should be embezzled. When Perugino perceived that the prior's constant inspection of the work was only occasioned by this distrust, he placed a pot of water near him, in which he often dipped his pencil, after he had loaded it with ultramarine; and the color, by its weight, instantly fell to the bottom. The prior observing the rapid consumption of his color, expressed his astonishment; but Perugino desired him neither to torment his own mind, nor indulge an unjust opinion of artists, who generally acted upon principles of honor; then pouring off the water gently, he restored to him the ultramarine which had subsided. Perugino, however, is said to have been avaricious, and that his being robbed of a box of gold was the principal cause of his death, which took place in 1524. His capital piece is thought to be an altar-piece in the church of St. Peter, at Perugia, of which the subject is the Ascension of Christ, with the disciples in different attitudes. The design is excellent, and the whole well executed. In a chapel belonging to the church of St. Giovanni in Monte is a picture of a virgin, attended by several saints, which is also esteemed one of his best performances. See MONTANINI.

PERVICA'CIOUS, *adj.*
PERVICA'CIOUSLY, *adv.*
PERVICA'CIOUSNESS, *n. s.*
PERVICAC'ITY,
PER'VICACY.
} Latin, *pervicax*. Spitefully obstinate; peevish; contumacious. Rarely used.

But in case of the *pervicacy* of a peevish heretic who would not submit to the power of the church, &c. *Taylor.*

Gondibert was in fight audacious,
But in his ale most *pervicacious*. *Denham.*

May private devotions be efficacious upon the mind of one of the most *pervicacious* young creatures! *Clarissa.*

PER'VIOUS, *adj.*
PER'VIOUSNESS, *n. s.*
} Lat. *pervius*. Admitting passage; capable of being permeated: quality of admitting a passage.

The Egyptians used to say, that unknown darkness is the first principle of the world; by darkness they mean God, whose secrets are *pervious* to no eye. *Taylor.*

The *perviousness* of our receiver to a body much more subtle than air, proceeded partly from the looser texture of that glass the receiver was made of, and partly from the enormous heat, which opened the pores of the glass. *Boyle.*

There will be found another difference besides that of *perviousness*. *Holder's Elements of Speech.*

Leda's twins,
Conspicuous both, and both in act to throw
Their trembling lances brandished at the foe,
Nor had they missed; but he to thickets fled,
Concealed from aiming spears, nor *pervious* to the steed. *Dryden.*

What is this little, agile, *pervious* fire,
This fluttering motion which we call the mind? *Prior.*

Those lodged in other earth, more lax and *pervious*, decayed in tract of time, and rotted at length. *Woodward.*

PERVISSE, a town of France, in the department of Lys, and late province of Austrian Flanders; six miles W. N. W. of Dixmude.

PERUKE', *n. s.* & *v. a.*
PERUKE'-MAKER, *n. s.*
} Fr. *perruque*; Ital. *perucca*. A cap of false hair; a periwig: to dress in false hair.

I put him on a linen cap, and his *peruke* over that. *Wiseman.*

PERUSE', *v. a.*
PERU'SALS, *n. s.*
PERU'SER.
} Lat. *per* and use, or *per-visus*. To read; observe; examine: perusal is the act of reading or examining: peruser, a reader; examiner.

Peruse this writing here, and thou shalt know
The treason. *Shakspeare. Richard II.*

I hear the enemy;
Out some light horsemen, and *peruse* their wings. *Shakspeare.*

I've *perused* her well;
Beauty and honour in her are so mingled,
That they have caught the king. *Id.*

The petitions being thus prepared, do you constantly set apart an hour in a day to *peruse* those petitions. *Bacon.*

Myself I then *perused*, and limb by limb
Surveyed. *Milton's Paradise Lost.*

Carefully observe, whether he tastes the distinguishing perfections or the specific qualities of the author whom he *peruses*. *Addison.*

As pieces of miniature must be allowed a closer inspection, so this treatise requires application in the *perusal*. *Woodward.*

The difficulties and hesitations of every one will be according to the capacity of each *peruser*, and as his penetration into nature is greater or less. *Id.*

If upon a new *perusal* you think it is written in the very spirit of the ancients, it deserves your care, and is capable of being improved. *Atterbury.*

Mr. Pope told him, that he read it once over, and was not displeased with it; that it gave him more pleasure at the second *perusal*, and delighted him still more at the third. *Johnson.*

PERUSIA, an ancient town of Etruria, on the Tiber, built by Oenus; where L. Antonius was besieged by Augustus, till he surrendered. (Strabo.) It is now called Perugia.

PERUVIAN BARK, or JESUITS' BARK, the bark of the cinchona officinalis, a well known medicine. See CINCHONA. The pale and the red are chiefly used in Britain. The pale is brought to us in pieces of different sizes, either flat or quilled, and the powder is rather of a lighter color than that of cinnamon. The red is generally in much larger, thicker, flattish pieces, but sometimes also in the form of quills, and its powder is reddish like that of Armenian bole. It is much more resinous, and possesses the sensible qualities of the cinchona in a much higher degree than the other sorts; and the more nearly the other kinds resemble the red bark, the better they are now considered. The red bark is heavy, firm, sound, and dry; friable between the teeth; does not separate into fibres; and breaks, not shivery, but short, close, and smooth. It has three layers; the outer is thin, rugged, of a reddish brown color, but frequently covered with mossy matter: the middle is thicker, more compact, darker colored, very resinous, brittle, and yields first to the pestle; the inmost is more woody, fibrous, and of a brighter red. The Peruvian bark yields its virtues both to cold and boiling water; but the decoction is thicker, gives out its taste more readily, and forms an ink with a chalybeate more suddenly than the fresh cold infusion. This infusion, however, contains at least as much extractive matter, but more in a state of solution; and its color, on standing some time with the chalybeate, becomes darker, while that of the decoction becomes more faint. When they are of a certain age, the addition of a chalybeate renders them green; and, when this is the case, they are in a state of fermentation, and effete. Mild or caustic alkalies, or lime, precipitate the extractive matter, which in the case of the caustic alkali is re-dissolved by a farther addition of the alkali. Lime-water precipitates less from a fresh infusion than from a fresh decoction; and in the precipitate of this last some mild earth is perceptible. The infusion is by age reduced to the same state with the fresh decoction, and then they deposit nearly an equal quantity of mild earth and extractive matter; so that lime-water, as well as a chalybeate, may be used as a test of the relative strength and perishable nature of the different preparations, and of different barks. Accordingly cold infusions are found by experiments to be less perishable than decoctions; infusions and decoction of the red bark than those of the pale; those of the red bark, however, are found by length of time to separate more mild earth with the lime-water, and more extracted matter. Lime-water, as precipitating the extracted matter, appears an equally improper and disagreeable menstruum. Water suspends the resin by means of much less gum than has been supposed. Rectified spirit of wine extracts a bitterness, but no astringency, from a residuum of twenty affusions of cold water; and water extracts astringency, but no bitterness, from the residuum of as many affusions of rectified spirit. The residua in both are insipid. From many ingenious experiments made on the Peruvian bark by Dr. Irvine, published in a dissertation which gained the prize medal given by the Harveian Society of Edinburgh for 1783, the power of different menstrua as acting upon Peruvian bark, is ascertained with greater accuracy than had before been done: and, with respect to comparative power, the fluids after mentioned act in the order in which they are placed:—1. Dulcified spirit of vitriol. 2. Caustic ley. 3. French brandy. 4. Rhenish wine. 5. Soft water. 6. Vinegar and water. 7. Dulcified spirit of nitre. 8. Mild volatile alkali. 9. Rectified spirit of wine. 10. Mild vegetable alkali. 11. Lime-water. The antiseptic powers of vinegar and bark united are double the sum of those taken separately. The astringent power of the bark is increased by acid of vitriol; the bitter taste is destroyed by it. The officinal preparations of the bark are, 1. The powder: of this the first parcel that passes the sieve, being the most resinous and brittle layer, is the strongest. 2. The extract: the watery and spirituous extract conjoined form the most proper preparations of this kind. 3. The resin: this cannot perhaps be obtained separate from the gummy part, nor would it be desirable. 4. Spirituous tincture: this is best made with proof spirit. 5. The decoction: this preparation, though frequently employed, is yet in many respects inferior even to a simple watery infusion. The best form is that of powder; in which the constituent parts are in the most effectual proportion. The cold infusion, which can be made in a few minutes by agitation, the spirituous tincture, and the extract, are likewise proper in this respect. For covering the taste, different patients require different vehicles; liquorice, aromatics, acids, port wine, small beer, porter, milk, butter-milk, &c., are frequently employed; and it may be given in form of electuary with currant jelly, with brandy, or with rum.

PERUVIAN CAMEL. See CAMELUS.

PERUVIAN HARE. See LEPUS.

PERUVIAN SHEEP. See CAMELUS.

PERUZZI (Balthasar), an historical painter and architect, born in 1481. He went to Rome, and was employed by Alexander VI., Julius II., and Leo X. He was so perfect in chiaro obscuro and perspective that Titian himself beheld his works with astonishment. He was in Rome in 1527, when Charles V. sacked it; but procured his liberty by painting a portrait of the constable, Bourbon. He died in 1556, aged fifty-five.

PERWANNAH, in the language of Bengal, an order of government, or a letter from a man in authority.

PERWUTTAM, a small town of Hindostan, situated on the south bank of the River Krishna, in a wild tract of country almost uninhabited, except by the Chinsuars, 118 miles south from Hyderabad. Red granite abounds here, and diamonds are found in the mountains; but the labor is so great, and the chance of meeting with the veins so uncertain, that the digging for them has been abandoned.

At this place is a remarkable pagoda dedicated to the deity called Mallecarjee, in showing of whom a great deal of mystery is observed. He is exhibited in the back part of a building, by the reflected light of a brass speculum, and of course can only be seen as the flashes fall on him. 'The idol is probably nothing more,' says Mr. Hamilton, 'than the Lingam so much reverenced by the votaries of Siva. The revenues derived from the resort of pilgrims are collected by a manager, who resides within the enclosure. There is a goddess also worshipped here, named Brahma Rumbo. The several pagodas, choultries, courts, &c., are enclosed by a wall 660 feet long, by 510 broad, the walls of which are covered by an infinite variety of sculpture.'

PES, in antiquities, a foot or measure of length among the Romans, equal to eleven inches 604 decimal parts. The πȣς, or foot of the Grecians, was equal to one foot and 875 decimal parts of an inch.

PES MONETÆ, in archæology, a true and reasonable adjustment of the value of all coin.

PESADE', *n. s.*

Pesade is a motion a horse makes in raising or lifting up his forequarters, keeping his hind legs upon the ground without stirring. *Farrier's Dictionary.*

PESANTE, in music, slow, dragging.

PESARO, a town of Italy in the States of the Church and province of Urbino, is situated near the Foglia, between the Adriatic and a range of cultivated hills. It is surrounded with fortifications and well built, the streets being clean and airy. Its market-place is ornamented with a fountain and marble statue of Urban VIII.: some of the churches are also remarkable for their paintings and architecture. The latter are San Giovanni, La Misericordia, and San Carolo. The inhabitants have little trade, but cultivate the surrounding country in wine, olives, figs, and silk. The climate was once very unhealthy in summer on account of the marshes, which are now drained. Pesaro is the see of a bishop. Population 10,000. Eighteen miles E. N. E. of Urbino, and thirty-four north-west of Cincona.

PESCE (Nicholas), a famous Sicilian diver, who, according to Kircher, was, from his amazing skill in swimming, and his perseverance under water, surnamed the fish. This man had from his infancy been used to the sea; and earned his scanty subsistence by diving for corals and oysters, which he sold to villagers on shore. His long acquaintance with the water, at last, brought it to be almost his natural element. Kircher says, 'He was frequently known to spend five days in the midst of the waves, without any other provisions than the fish which he caught there and ate raw. He often swam over from Sicily into Calabria, a tempestuous and dangerous passage, carrying letters from the king. He was frequently known to swim among the gulfs of the Lipari Islands, no way apprehensive of danger. Some mariners out at sea, one day observed something at some distance from them, which they regarded as a sea-monster; but, upon its approach, it was known to be Nicholas, whom they took into their ship. When they asked him whither he was going in so stormy and rough a sea, and at such a distance from land, he showed them a packet of letters, which he was carrying to one of the towns of Italy. He kept them thus company for some time in their voyage, conversing, and asking questions; and, after eating a hearty meal with them, took his leave, and, jumping into the sea, pursued his voyage alone. In order to aid these powers of enduring in the deep, nature seemed to have assisted him in a very extraordinary manner; for his fingers and toes were webbed, and his chest became very capacious. The account of so extraordinary a person did not fail to reach the king himself; who commanded Nicholas to be brought before him. The curiosity of this monarch had been long excited by the accounts he had heard of the bottom of the Gulf of Charybdis, which he now therefore commanded our poor diver to examine; and, as an incitement to his obedience, ordered a golden cup to be flung into it. Nicholas was not insensible of the danger to which he was exposed, and he presumed to remonstrate: but the hope of the reward, the desire of pleasing the king, and the pleasure of showing his skill, at last prevailed. He instantly jumped into the gulf, and continued for three-quarters of an hour below; during which time the king and his attendants became very anxious for his fate; but he at last appeared, holding the cup in triumph in one hand, and making his way good among the waves with the other. Having refreshed himself by sleeping, there were four things, he said, which rendered the gulf dreadful, not only to men, but to fish. 1. The force of the water bursting up from the bottom, which required great strength to resist. 2. The abruptness of the rocks that on every side threatened destruction. 3. The force of the whirlpool dashing against those rocks. And, 4. The number and magnitude of the polypous fish, some of which appeared as large as a man; and which, every where sticking against the rocks, projected their fibrous arms. Being asked how he was able so readily to find the cup that had been thrown in, he replied that it happened to be flung by the waves into the cavity of a rock against which he himself was urged in his descent. This account, however, did not satisfy the king's curiosity. Being requested to venture once more into the gulf for further discoveries, he at first refused: but the king repeated his solicitations; and, to give them still greater weight, produced a larger cup than the former, and added also a purse of gold. With these inducements, says Kircher, the unfortunate diver once again plunged into the whirlpool, and was never heard of more.'

PESHAWUR, PESHOUR, or PEISHORE, a city and district of Afghaunistaun, in the province of Cabul, formerly Bekram. It is watered by the Kameh or Cabul River, and surrounded on all sides except the east by a range of mountains, which defend it from the blasts of winter, but render it very hot during the summer solstice. The soil is a rich black mould, watered by an innumerable number of mountain streams. It is inhabited by five tribes of Afghauns, the principal of whom are the Mohammed Zyes and the Momends; and is said to contain 300,000 inhabitants. It is the favorite residence of the Afghaun court in winter, is celebrated for its extensive gardens and fruit, particularly melons, and is without doubt one of the finest spots in the king's dominions. The revenue is estimated at £100,000 sterling.

PESHAWUR, the ancient capital of the above mentioned district, stands on an uneven surface, is upwards of five miles in circumference. The houses are of unburnt brick, in wooden frames, and are mostly three stories high. The streets are narrow, but paved, with a kennel in the middle. Two or three brooks which run through the town, are crossed by bridges, which fall into the Kameh or Cabul River, which passes some miles north of the city. There are many mosques in the town, but none of them are worthy of notice, except a fine caravanserai, and the Bala Hissar or citadel, situated on a hill to the north, which contains some fine halls, and is adorned with some spacious gardens. It is the occasional residence of the king. Some other of the palaces are splendid. The city is inhabited by persons from all parts of the east, but the common languages are the Pushtoo and Hindostany. Peshawur is mentioned in the tenth century, but was much improved by the emperor Akber, and has long been the residence of a brave tribe, called the Hazarees, of Tartar origin.

PESSARY, *n. s.* Fr. *pessaire*; Gr. *πεσσαριον*. An oblong form of medicine, made to thrust up into the uterus.

Of cantharides he prescribes five in a *pessary*, cutting off their heads and feet, mixt with myrrh. *Arbuthnot.*

PESSARY, in medicine, is also a solid substance composed of wool, lint, or linen, mixed with powder, oil, wax, &c., made round and long like a finger, in order to be introduced in the exterior neck of the matrix, for the cure of uterine disorders.

PESSIERE, French, in fortification, a dam that is raised for the purpose of confining a sufficient quantity of water in a reservoir, by which any machine may be worked, or kept in motion. The overflowing of the river may run over this dam without doing any injury to it.

PEST, *n. s.*, PEST'-HOUSE, PESTIF'EROUS, *adj.* Fr. *peste*; Lat. *pestis*. Plague; pestilence; mortal or destructive disease; any thing mischievous or destructive: pest-house, a hospital; particularly for those infected with the plague: pestiferous is destructive; malignant; infectious.

Such is thy audacious wickedness,
Thy leud, *pestiferous*, and dissentious pranks,
The very infants prattle of thy pride. *Shakspeare.*

At her words the hellish *pest*
Forbore. *Milton's Paradise Lost.*

In a bodily contagion, we hold it not safe to suffer the sick persons to converse with the whole; but remove them to a *pest-house* remote from the vicinity of others. *Bp. Hall.*

Of all virtues justice is the best;
Valour without it is a common *pest*. *Waller.*

Let fierce Achilles
The god propitiate, and the *pest* assuage. *Pope.*

The *pest* a virgin's face and bosom bears,
High on her crown a rising snake appears,
Guards her black front, and hisses in her hairs.
Id.

It is easy to conceive how the steams of *pestiferous* bodies taint the air, while they are alive and hot. *Arbuthnot.*

Stand aloof,
And let the *pest's* triumphal chariot
Have open way advancing to the tomb.
See how he mocks the pomp and pageantry
Of earthly kings! *Wilson.*

PEST, or PESTH, a palatinate of Hungary, lying chiefly along the east bank of the Danube, from the point where it begins to flow southward to the borders of the palatinate of Batsch. It is composed of three counties, which were formerly distinct, viz. Pest, Pellsh, or Pilis, and Solt. That of Pilis lies to the west of the Danube, and contains the town of Buda. These counties supply the chief branch of the revenue of the palatine of Hungary. Their area is 4050 square miles, and their population 362,000. The inhabitants are a mixed race, being partly Magyars, partly Sclavonians, Germans, Walachians, gypsies and Jews. The surface is generally level, and the heath of Ketskemet (see KETSKEMET) is one of the most remarkable tracks in the kingdom; yet in the north there are several mountains. The country is laid out in tillage and pasturage. Wine of good quality is made at Buda. Near Pest is the plain of Rakos, where the Hungarian diet used to meet.

PEST, or PESTH, a considerable city of Hungary, is situated on the bank of the Danube; the course of the river being from north to south; and Pesth standing on the east bank, opposite to Buda. It is only separated from that place by a bridge of boats, three-quarters of a mile in length. Buda is the residence of the viceroy, and accounted consequently the capital of the country; but Pest is the seat of the high courts of justice, and the place of meeting for the diet. It is also considerably larger, having 42,000 inhabitants. It consists of the Old and New Towns; throughout the whole, the streets are tolerably spacious and regular, and the houses respectable. Of the public buildings, the principal are the hospital of invalids, the barracks, and a quadrangular military edifice, begun in 1786 by Joseph II. Of the churches, the Catholics have four; the Lutherans, the Calvinists, and the followers of the Greek faith, one each. The university, the only one in Hungary, is richly endowed: the professors are forty in number; the students between 700 and 800. The observatory is on the Buda side of the river. The manufactures here comprise silks, cotton, jewellery, leather, and musical instruments; also tobacco, which is a government monopoly. The Danube affords means of intercourse with a large track of country, and the fairs of Pesth are numerously attended. Here is a theatre, erected in 1808; public walks near the Danube, and public gardens; on the Buda side of the river are hot springs. The city is not of remote origin, but has often been besieged. It is 130 miles E. S. E. of Vienna.

PESTALOZZI, or PESTALUZ (Henry), a practical philosopher of the Seven Cantons, famous as the inventor of a modern mode of instruction.

He was born of a good family at Zurich, January 12th, 1745, acquired early habits of industry, and adopted from inclination the employment of a teacher. He first developed his very original ideas in a fictitious narrative, entitled Lienhard and Gertrude, printed at Leipsic in 1781–1787, which has been translated into most European languages. Pestalozzi was powerfully seconded in his philanthropic projects by Tscharner, bailli of Wildenstein, a rich Swiss proprietor, the Arner of his romance. He composed many other works, with a view to the same object; and amongst others a weekly paper, the numbers of which were republished in 2 vols. 8vo.; Letters on the Education of the Children of Indigent Parents; Reflections on the Progress of Nature in the development of the Human Species; Images for my Abecedary, or Elements of Logic for my Use. In 1799 the Helvetic government appointed him director of the orphan-house at Stantz, in the canton of Underwald; and, on the dissolution of that establishment, the chateau of Burgdorf, four leagues from Berne, was granted him. The number of pupils which now flocked to him induced him to remove his seminary to the castle of Yverdun. In 1803 the canton of Zurich nominated him a member of the Helvetic Consulta, summoned by Buonaparte to Paris; and he subsequently received from the emperor of Russia the order of St. Wladimir. He closed a long and philanthropic life on the 17th of February, 1827, at Brugg, in Switzerland.

PESTER, *v. a.* PES'TERER, *n. s.* PES'TEROUS, *adj.* } Fr. *pester*, à Lat. *pestis*. To annoy; perplex; harass; encumber: a pesterer is one who harasses or disturbs: pesterous, cumberous; annoying.

Fitches and pease
For *pestering* too much on a hovel they lay. *Tusser.*

Who then shall blame
His *pestered* senses to recoil and start,
When all that is within him does condemn
Itself for being there? *Shakspeare. Macbeth.*

He hath not failed to *pester* us with message,
Importing the surrender of those lands. *Shakspeare.*

In the statute against vagabonds note the dislike the parliament had of gaoling them, as that which was chargeable, *pesterous*, and of no open example. *Bacon's Henry VII.*

Confined and *pestered* in this pinfold here,
Strive to keep up a frail and feverish being. *Milton.*

We are *pestered* with mice and rats, and to this end the cat is very serviceable. *More against Atheism.*

A multitude of scribblers daily *pester* the world with their insufferable stuff. *Dryden.*

They did so much *pester* the church and delude the people, that contradictions themselves asserted by Rabbies were equally revered by them as the infallible will of God. *South.*

At home he was pursued with noise;
Abroad was *pestered* by the boys. *Swift.*

I am positive I have a soul; nor can all the books with which materialists have *pestered* the world ever convince me to the contrary. *Sterne.*

PESTILENCE, *n. s.* PES'TILENT, *adj.* PESTILEN'TIAL, PES'TILENTLY, *adv.* } Fr. *pestilence*; Lat. *pestilentia*. Pest; plague; mortal or infectious distemper: pestilent and pestilential mean, partaking of the nature of pestilence; contagious; producing plague or disease; malignant: pestilently is mischievously; destructively.

We have found this man a *pestilent* fellow, and a mover of sedition among all the Jews. *Acts* xxiv. 5.

There is nothing more contagious and *pestilent* than some kinds of harmony; than some nothing more strong and potent unto good. *Hooker.*

Hoary moulded bread the soldiers thrusting upon their spears railed against king Ferdinand, who with such corrupt and *pestilent* bread would feed them. *Knolles.*

The red *pestilence* strike all trades in Rome,
And occupations perish. *Shakspeare.*

Great ringing of bells in populous cities dissipated *pestilent* air, which may be from the concussion of the air, and not from the sound. *Bacon.*

One *pestilent* fine,
His beard no bigger though than thine,
Walked on before the rest. *Suckling.*

Which precedent, of *pestilent* import,
Against thee, Henry, had been brought. *Daniel.*

If government depends upon religion, then this shews the *pestilential* design of those that attempt to disjoin the civil and ecclesiastical interests. *South.*

Fire involved
In *pestilential* vapours, stench, and smoak. *Addison.*

These with the air passing into the lungs, infect the mass of blood, and lay the foundation of *pestilential* fevers. *Woodward.*

To those people that dwell under or near the equator a perpetual spring would be a most *pestilent* and insupportable summer. *Bentley.*

The world abounds with *pestilent* books, written against this doctrine. *Swift's Miscellanies.*

PESTILLATION, *n. s.* PES'TLE. } Lat. *pistillum*; Ital. *pestello*, *pistelle*. The act of pounding or breaking in a mortar: the instrument with which things are broke in a mortar.

The best diamonds are comminuble, and so far from breaking hammers, that they submit unto *pestillation*, and resist not any ordinary *pestle*. *Browne.*

What real alteration can the beating of the *pestle* make in any body, but of the texture of it? *Locke.*

Upon our vegetable food the teeth and jaws act as the *pestle* and mortar. *Arbuthnot.*

PESTIS, the plague. See MEDICINE, Index.

PET, *n. s.* PET'TISH, *adj.* PET'TISHNESS, *n. s.* } Ital. *petto*; Lat. *pectus*, the breast? A slight passion or grief: pettish is fretful; peevish: pettishness, peevishness.

Nor doth their childhood prove their innocence;
They're froward, *pettish*, and unused to smile. *Creech.*

If all the world
Should in a *pet* of temperance feed on pulse,
Drink the clear stream and nothing wear but frieze,
The all-giver would be unthankt, would be unpraised. *Milton.*

If we cannot obtain every vain thing we ask, our next business is to take *pet* at the refusal. *L'Estrange.*

Life, given for noble purposes, must not be thrown up in a *pet*, nor whined away in love. *Collier.*

Like children, when we lose our favorite plaything, we throw away the rest in a fit of *pettishness*. *Id.*

They cause the proud their visits to delay,
And send the godly in a *pet* to pray. *Pope.*

PET', *n. s.* Probably from petit, little. See PEAT. A lamb taken into the house, and brought up by hand: a cade lamb.

PETAL, *n. s.* } Lat. *petalum*. The leaf of
PET'ALOUS. } a flower: having petals.

Petal is a term in botany, signifying those fine coloured leaves that compose the flowers of all plants: whence plants are distinguished into monopetalous, whose flower is one continued leaf; tripetalous, pentapetalous, and polypetalous, when they consist of three, five, or many leaves. *Quincy.*

PETAL, in botany. See BOTANY.

PETALIFORME. See BOTANY.

PETALISM, a mode of deciding on the guilt of citizens, similar to the Athenian Ostracism. It was introduced in Syracuse about A. A. C. 460, to prevent the tyranny of the richer citizens, who had often about that time aimed at the diadem. To prevent, therefore, the evils daily arising from thence, and to bring down the aspiring minds of the wealthy citizens, the Syracusans were obliged to make a law like that of the Athenian ostracism; differing only in this, that every citizen at Syracuse should write on a leaf, instead of a shell, the names of such as they apprehended powerful enough to usurp the sovereignty. When the leaves were counted, he who had the most suffrages against him was, without farther enquiry, banished for five years. This method of weakening the interest of the overgrowing citizens was called petalism, from πεταλον, a leaf. This law was attended with many evil consequences; for those who were most capable of governing the commonwealth were driven out, and the administration of public affairs committed to the meanest of the people; nay, many of the chief citizens, who were able to render their country great service, fearing to fall under the penalties of this law, withdrew from the city, and lived private in the country, not concerning themselves with public affairs: whence, all the employments being filled with men of no merit or experience, the republic was on the brink of ruin, and ready to fall into a state of anarchy and confusion. The law, therefore, of petalism, upon more mature deliberation, was repealed soon after it had been enacted, and the reins of government were again put into the hands of men who knew how to manage them.

PETALITE, a mineral discovered in the mine of Uto in Sweden by M. D'Andrada, interesting, from its analysis by M. Arfredson having led to the knowledge of a new alkali.

This rare mineral occurs in masses, which have a foliated structure, and are divisible in directions parallel to the planes of a four-sided prism, whose bases are elongated rhombs, or parallelograms with angles of 137° 08′ and 42° 52′, according to Haüy. The laminæ are sometimes scaly, undulated, or interlaced. It scratches glass, and has nearly the hardness of feldspar. Its lustre is usually glistening, and somewhat pearly; the planes, produced by mechanical division in one direction, have however a higher lustre. It is translucent in different degrees; and its color is white, either milk white, or with shades of gray, red, or green; the red sometimes appears as a slight tinge of pink. Its specific gravity is between 2·4 and 2·6.

Chemical characters.—When strongly heated by the blow-pipe it melts, according to Arfvedson, into a transparent porous glass. Unless the fragment be very minute, its surface only will be fused. It contains, according to a mean of three analyses by Arfvedson, silex 79·2, alumine 17·2, lithia 5·7; = 100·1. Professor Clarke's analysis gives silex 80·0, alumine 15·0, lithia 1·75, oxide of manganese 2·5, water 0·75. An analysis by Vauquelin gives silex 78, alumine 13, lithia 7; = 98.

The new alkali, lithia, was first discovered in the petalite by Arfvedson. It sometimes resembles white quartz, but is easily distinguished by the foregoing characters:—It has been found only in Sweden, at Uto, Sahla, and Finngrufa, and is usually associated with quartz, feldspar, spodumen, &c.

This interesting mineral has been lately said by Dr. Brewster to have a perfect crystalline structure, and to possess two axes of double refraction.

PETAR', *n. s.* } Fr. *petard*; Ital. *petardo*;
PETARD', *n. s.* } of Lat. *pedo*. An exploding engine of warfare, used formerly in sieges. See below.

'Tis the sport to have the engineer
Hoist with his own *petard*. *Shakspeare. Hamlet.*

Find all his having and his holding,
Reduced t' eternal noise and scolding;
The conjugal *petard* that tears
Down all portcullices of ears. *Hudibras.*

A *petard* is an engine of metal, almost in the shape of a hat, about seven inches deep, and about five inches over at the mouth; when charged with fine powder well beaten, it is covered with a madrier or plank, bound down fast with ropes, running through handles, which are round the rim near the mouth of it: this *petard* is applied to gates or barriers of such places as are designed to be surprised, to blow them up: they are also used in countermines to break through into the enemy's galleries.
Military Dictionary.

PETAR, or PETARD. Fr. petard, Italian petardo. A petard is an engine of metal, almost in the shape of a hat, about seven inches deep, and about five inches over at the mouth; when charged with fine powder, well beaten, it is covered with a madrier or plank, bound down fast with ropes, running through handles, which are round the rim, near the mouth of it. The petard is applied to gates or barriers of such places as are designed to be surprised, to blow them up; they are also used in countermines, to break through into the enemy's galleries. Its invention is ascribed to the French Huguenots in 1579, who by means of petards took Cahors, in the same year. Petards are of four different sizes: the first contains 12 lbs. 13 ozs.; second 10 lbs. 11 ozs.; third 1 lb. 10 ozs.; fourth 1 lb. The blind fuse composition for them is of mealed powder 7 lbs., wood ashes 3 ozs.

PETAU (Denis), or PETAVIUS (Dionysius), a French Jesuit of great erudition, born at Orleans in 1583. He was but nineteen years of age when he was made professor of philosophy in the University of Bourges. He joined the Jesuits in 1605, and did great credit to them by his erudition. He became a zealous advocate for the church of Rome; and criticised and abused its adversaries. His chief work, which is still in great repute, he entitled Rationarium Temporum. It is an abridgment of universal history, from the earliest times to 1632, with authorities. He died at Paris in 1652.

PETAURI, in zoology, flying squirrels; a subdivision in the genus sciurus. They have a hairy membrane extended from the fore to the hind legs, adapted for flying. They are styled by Linnæus and Gmelin sciuri volantes, flying squirrels, in distinction from the sciuri scandentes, or climbing squirrels; but Dr. Shaw styles them petauri, wherein he is followed by Mr. Kerr, who enumerates eight species. See SCIURUS.

PETAURISTÆ, in antiquity, those who exhibited their feats on the petaurum.

PETAURUM. Gr. *πεταυρον*, or *πετευρον*, a ledge fixed to a wall, on which birds used to roost.—Varro de Re Rust, l. 3, c. 9; Poll. Onom. l. 10, segm. 156. The petaurum was also a machine hung high in the air, from which the petauristæ threw themselves, and descended to the earth by means of a rope.—Juv. Sat. 14, v. 265.

PETCHELEE, a large and flat province of the Chinese empire, in which Pekin is situated. The sea is the western boundary of the province, and, with the river Peiho, enables it to carry on a considerable trade with Corea and Japan. Its prosperity is chiefly supported by the communication maintained by its rivers with the imperial canal. By it the tribute of all the provinces, paid chiefly in kind, is conveyed, and vast numbers of persons who live entirely on the water, subsisting by fishing or breeding of ducks. The population was stated to Sir George Staunton at 38,000,000; but this there can be no doubt is a good deal exaggerated. Rice, wheat, and barley, are raised here.

PETECHIÆ, in medicine, a name given to those spots, whether red or of any other color, which appear in malignant fevers.

PETECHIAL, *adj.* Lat. *petechiæ*. Pestilentially spotted. Obsolete.

In London are many fevers with buboes and carbuncles, and many *petechial* or spotted fevers.

Arbuthnot.

PETER (St.), the apostle, born at Bethsaida, was son of Jonas, and brother of St. Andrew.—John i. 42, 43. His first name was Simon; but, when our Saviour called him to the apostleship, he changed his name into Cephas, that is, in Syriac, a stone, or a rock; in Latin petra, whence Peter. He was a married man; and had his house, his mother-in-law, and his wife, at Capernaum, upon the lake of Gennesareth.—Mark i. 29; Mat. viii. 14; Luke iv. 38. St. Andrew, having been first called by Jesus Christ, met his brother Simon, and told him (John i. 41), 'we have seen the Messiah,' and then brought him to Jesus. After having passed one day with our Saviour, they returned to their ordinary occupation, fishing. But it is thought they were present with him at the marriage of Cana in Galilee This happened A. D. 30. St. Peter's miraculous draught of fishes; the cure of his wife's mother; his walking upon the waters; his answers to our Saviour's important questions; his presence at the transfiguration; his payment of the tribute; his questions respecting forgiveness, and the destruction of the temple; his vain self-confidence that he would stand by his Lord; his triple denial of him soon after, with his consequent repentance; his meeting with him after his resurrection; his second miraculous draught of fishes; our Saviour's trying questions to him; his meeting with the other apostles; the miraculous gift of tongues; his sermon, or address to the people; the consequent conversion of 3000 persons; his miraculous cure of the lame beggar, and conversion of other 5000; his imprisonment by the priests and sadducees, and his boldness on that occasion; his annunciation of death to Ananias and Sapphira; his second imprisonment and liberation by an angel; his boldness before the Jewish rulers; his sufferings and dismission; his preaching at Samaria; his reproof to Simon the magician; his cure of Æneas at Lydda; his raising up Tabitha from death; his vision at Joppa, the message to him from Cornelius, and his conversion; Peter's visit to him, and the consequences; his return to Jerusalem; with his imprisonment by Herod Agrippa, A. D. 44; are all recorded, with many other interesting particulars, in the Gospels and Acts of the Apostles. After his delivery from prison by the angel, he left Jerusalem; but we are not told what became of him till the council held at Jerusalem in the year 51. It is thought that before this time he made his second journey to Rome, whence he wrote his first epistle. St. Peter was obliged to leave Rome in the year 51, by order of the emperor Claudius, who had banished all Jews from thence. The particulars of St. Peter's life are little known from A. D. 51, in which the council of Jerusalem was held, till his last journey to Rome, which was some time before his death. Then, being acquainted by revelation that the time of his death was not far off (2 Pet. i. 14), he wrote to the faithful his second epistle. St. Peter and St. Paul came to Rome, it is said, about the same time, A. D. 65, where they performed many miracles, and made many converts. Simon Magus, by his tricks, continued here to deceive the people, pretending himself to be the Messiah, and even attempting to ascend into heaven. See SIMON MAGUS. Soon after this St. Peter was thrown into prison, where he continued, we are told, for nine months; at last he was crucified in the Via Ostia, with his head downwards, as he himself had desired of his executioners. This he did out of a sense of humility, lest it should be thought, as St. Ambrose says, that he affected the glory of Jesus Christ. It is said that his body was at first buried in the catacombs, two miles from Rome, from whence it was afterwards transported to the Vatican, where it has lain ever since. His festival is celebrated with that of St. Paul, on the 29th of June. St. Peter died A. D. 66, after having been bishop of Rome, according to the general account, about twenty-four or twenty-five years. His age was about seventy-four or seventy-five. It is agreed that St. Linus was his successor. St. Peter has been made the author of several books; such were his Acts, his Gospel, his Revelation, his work about preaching, and another about Judgment. There is extant a large history of

St. Peter, called The Recognition, ascribed to St. Clement.

Peter of Blois, a learned man of the twelfth century, born about 1120, at Blois, in France. He was the first person who employed the famous word transubstantiation. He was appointed preceptor to William II. king of Sicily, in 1167, and obtained the custody of the privy seal. In 1168 he left Sicily and returned into France. He was soon after invited into England by Henry II., who employed him as his private secretary, made him archdeacon of Bath, and gave him some other benefices. When he had spent a few years at court, he retired into the family of Richard archbishop of Canterbury, who had made him his secretary and chancellor about 1176. In this station he continued to the death of the archbishop in 1183, enjoying the highest degree of favor with that prelate. Our author remained in the same station with archbishop Baldwin, who succeeded Richard. He was also sent by that prelate to plead his cause before pope Urban III. After the departure of Baldwin for the Holy Land, in 1192, our author was involved in various troubles in his old age; and died about the end of the twelfth century. He appears from his works, which may be justly reckoned among the most valuable monuments of the age in which he flourished, to have been a man of great integrity and sincere piety, as well as of a lively inventive genius and uncommon erudition. His printed works consist of 134 letters, which he collected at the desire of Henry II.; of sixty-five sermons; and of seventeen tracts on different subjects.

Peter the Hermit. See Crusades, vol. iv. p. 680.

Peter I., styled the Great, czar, and afterwards emperor of Russia, founder of the Russian empire; for though the country was well known, and of great antiquity, yet it had no extent of power, of political influence, or of general commerce, in Europe, till his time. He was born in 1672; and was proclaimed czar when but ten years of age, in exclusion of John his elder brother, who was of a sickly constitution and weak mind. The princess Sophia, his half sister, made an insurrection in favor of John; and, to put an end to the civil war, it was at last agreed that the two brothers should jointly share the imperial dignity. Peter had been very negligently educated, not only through the general defects of the Russian system, but likewise through the arts of the Princess Sophia, who surrounded him with every thing that might stifle his natural desire of knowledge, and deprave his mind. Notwithstanding this, his inclination for military exercises discovered itself in his tenderest years. He formed a company of fifty men, commanded by foreign officers, clothed and exercised after the German manner; he entered himself into the lowest post, that of a drummer; and never rose otherwise than as a soldier of fortune. He now reinforced his company with several others, till at last he had got together a considerable body of soldiers, and by this means gradually secured a body of well disciplined troops. The sight of a Dutch vessel which he had met with on a lake belonging to one of his pleasure-houses, made such an impression on his mind, that he conceived the almost impracticable design of forming a navy. His first care was to get some Hollanders to build some small vessels at Moscow; and he passed two successive summers on board English or Dutch ships, which set out from Archangel, that he might instruct himself in every branch of naval affairs. In 1696 czar John died, and Peter was now sole master of the empire. In 1698 he sent an embassy to Holland; and went incognito in the retinue, visiting England as well as Holland, to inform himself fully in the art of ship-building. At Amsterdam he worked in the yard as a private ship-carpenter, under the name of Peter Michaelof; but he has been often heard to say, that if he had never gone to England, he had remained ignorant of that art. In 1700 he had got together a body of standing forces, consisting of 30,000 foot; and now the vast project he had formed displayed itself in all its parts. He opened his dominions to all intelligent travellers, having first sent the chief nobility of his empire into foreign countries to improve themselves in knowledge and learning, and invited into Russia all the foreigners he could meet with, who were capable of instructing his subjects. This raised many discontents; and the despotic authority he exerted on that occasion was scarcely powerful enough to suppress them. In 1700, being strengthened by the alliance of Augustus king of Poland, he made war on Charles XII. king of Sweden. His first ill success did not deter him; for he used to say, 'my armies must be overcome, but this will at last teach them to conquer.' He afterwards gained considerable advantages; and founded Petersburg in 1703. In 1709 he gained a complete victory over the Swedes at Pultowa. Being in 1712 enclosed by the Turks on the banks of the Pruth, he seemed inevitably lost; and, had not the czarina Catharine bribed the grand vizier, even the czar's prudence could not have effected his deliverance. In 1716 he made a tour through Germany and Holland, and visited the royal academy of sciences at Paris. It would be endless to enumerate all the various establishments for which the Russians are obliged to him. He formed an army on the model of the most military nations: he fitted out fleets in all the four seas which border upon Russia: he caused many strong fortresses to be raised after the best plans; and made convenient harbours: he introduced arts and sciences into his dominions, and freed religion from many superstitious abuses; he built cities, cut canals, &c.; was generous in rewarding, impartial in punishing; faithful, laborious, and humble: yet was he not free from roughness of temper. He had indeed cured himself of excess in drinking; but he has been branded with other vices, particularly cruelty. He certainly caused his unfortunate son prince Alexis to be executed, and was equally severe to his son's friends. He beheaded his own brother-in-law count Lapuchin, brother to his wife Ottokessa Lapuchin whom he had divorced, and uncle to prince Alexis. The prince's confessor also forfeited his head. The remainder of the czar's life was a series of grand projects, labors, and exploits, that seemed to efface the memory of his excessive severities. He made frequent speeches to his court and to his council. In one he told them that he had sacrificed his son to the welfare of his dominions. He died of the strangary in 1725, and left the world at least with the magnanimity of a hero, if not with the piety of a Christian. Peter was tall of stature, and of a bold and majestic aspect, though sometimes disfigured by convulsions, which altered his features. He conversed with persons in all stations; loved women; and valued himself on drinking large draughts, rather than sipping delicious wines. For a minuter account of his improvements, &c. see RUSSIA, PETERSBURG, &c.

PETER II. emperor of Russia, the son of the unfortunate prince Alexis, was born in 1715; and in 1727 succeeded the empress Catharine I., who had declared him grand duke in 1726. The most remarkable event of his reign was the disgrace of prince Menzikoff. See MENZIKOFF. He died in 1730, aged fifteen.

PETER III., emperor of Russia, was the son of Charles Frederick, duke of Holstein Gottorp, by the princess Anne, daughter of Peter the Great, and was born in 1728. On the death of the empress Elizabeth, in 1762, he succeeded to the throne, but did not long enjoy it; being dethroned the same year by his wife, Catharine II. He died in confinement seven days afterwards, and, as is generally believed, was murdered in a barbarous manner.

PETER III., king of Arragon, succeeded his father James I. in 1276, and turned his arms against Navarre, to which kingdom he laid claim; but failed in the conquest of it. He married the daughter of Manfred king of Sicily; and, to effect the conquest of that island, contrived the horrible massacre of the French, called the Sicilian Vespers. See SICILY. For this crime he and the Sicilians were excommunicated by pope Martin IV. He died at Villefranche in 1282.

PETER THE CRUEL, king of Castile, succeeded his father Alphonsus XI. in 1350, in his sixteenth year, and proved a most barbarous and bloody tyrant; which provoked his subjects to rebel and expel him; but, little to the honor of the English, was restored by their assistance under the command of the brave Black Prince Edward. He was afterwards, however, abandoned by him, and met his just fate from his brother Henry, count of Trastamara, who killed him with his own hand. See SPAIN.

PETER was also the name of four kings of Portugal. See PORTUGAL.

PETER, or DON PEDRO, of Portugal, duke of Coimbra, was the second son of John, king of Portugal, and born 4th March, 1394. He was one of the most accomplished princes of his age; was himself very learned, and was a patron of all learned men. To increase his knowledge, he travelled through the principal countries of Europe, Asia, and Africa, with a train suitable to his quality; of which travels an account was published, but, according to the spirit of the times, loaded with romantic fables. On his return he married Isabel, daughter of count Urgel, and grand-daughter of king Peter IV. He visited England, and was made a knight of the garter, April 22nd, 1417, by his cousin Henry V., who was grandson of John of Gaunt by the father, as Don Pedro was by the mother. In 1440 he was appointed regent of Portugal, during the minority of his cousin Alphonsus V. His regency was so mild as well as just, that the people of Lisbon asked leave to erect a statue to him, which this great prince declined. He governed the kingdom with so much propriety that Portugal was never more respected by the other powers of Europe. He diminished the taxes, maintained the laws in their vigor, and gave the young king an excellent education; who, when he came of age, was so pleased with his conduct, that he married and raised to the throne, the duke's daughter, Donna Isabella, in 1446. Yet all his merits did not prevent the envy of some courtiers, who at last got so much the ear of the monarch as to persuade him that the duke was a traitor: but, upon an inspection of his papers, Alphonsus became convinced of his innocence; and, as the only amends he could now make, ordered his body to be interred with every mark of honor in his own sepulchre.

PETER, THE WILD BOY, a savage, found in the woods near Hamelen, a town in the electorate of Hanover, when king George I. with a party of friends was hunting in the forest of Hertswold. He was supposed to be then about twelve years of age, and had subsisted in those woods, upon leaves, berries, wild plants, bark of trees, &c., from his infancy. In 1726 he was brought over to England, and put under the care of Dr. Arbuthnot, with proper teachers. But though there appeared no natural defect in his organs of speech, he could never be brought to articulate a syllable distinctly. He was afterwards committed to the care of different persons, but never acquired any degree of improvement. He died the 22nd of February, 1785, when he was supposed to be seventy-two years old. He was well made; middle-sized; had no appearance of an idiot, nor any thing particular in his form, except two of his fingers united by a web up to the middle joint. He was delighted with music, and learned to hum a tune. He had a fore-knowledge of bad weather. Lord Monboddo gives a particular description of him, as an instance of his favorite hypothesis, that 'man in a state of nature is a mere animal.'

PETER LE PORT (St.), a market town of Guernsey, situated on the south-eastern part of the island, consists of one long narrow street. It is defended by the Old castle and Castle Cornet. The latter, which commands both the town and harbour, is situated on a rock, separated from the land by an arm of the sea, 600 yards wide, and fordable only at low water. The harbour has a good road for shipping. The pier, a fine work, formed of stones joined together with great regularity, affords not only security to vessels, but being paved on the top, and guarded by parapets, is a pleasant and extensive parade, with a fine prospect of the sea and the neighbouring islands.

PETERBOROUGH, a city of Nassaburgh hundred, Northamptonshire, six miles and a half north by east from Stilton, and eighty-one north from London, is situate on the border of Hunts, on the northern side of the river Nen, which runs hence through Wisbeach, and is navigable up to the city. It is supposed to have taken its name from a monastery erected about the year 660, dedicated to St. Peter. After the monastery had flourished about 200 years it was totally destroyed by the Danes, and continued in ruins during a century, when Ethelwold, bishop of Winchester, with the assistance of Edgar and his chancellor Adulf, who was afterwards abbot, rebuilt this abbey in the most magnificent and stately manner: the abbots were mitred afterwards, and sat in parliament. At the dissolution of religious houses it was converted into a cathedral, for a bishop, dean, and six canons, eight choristers, a master, two schoolmasters, twenty scholars, six almsmen, and other officers. The cathedral suffered much during the civil war, but was thoroughly repaired some years ago. It is a noble structure, 409 feet long, and 203 broad. Amongst other monuments is one to the memory of the unfortunate Catharine of Arragon, wife of Henry VIII., and another to the memory of Mary Queen of Scots, both of whom were buried here. There is only one parish church, St. John's, besides the cathedral. The streets of Peterborough are regular, but the town has a dull appearance: near the cathedral is a good market-house, over which are held the sessions for the hundred. It has also a well endowed charity school for twenty boys and forty girls, a free-school, and a sunday School. The trade in coal, corn, and timber, is considerable, aud the stocking manufacture is carried on to some extent. On the whole this is the least city, and the poorest bishopric in England; but the jurisdiction called Peterborough Soke or Liberty extends over thirty-two towns and hamlets in the neighbourhood, in all which places the civil magistrates hold their quarter sessions of the peace, &c. The city is governed by a mayor, recorder, six aldermen, and eight common council, and sends two members to parliament. They are chosen by the inhabitants paying scot and lot, in number about 450; and the dean and chapter, who are lords of the manor, appoint the returning officers. Near the city is Caerdyke, an ancient foss made by the Romans for draining the fens. Market on Saturday. Fairs July 10th: October 2d and 3d.

Peterborough, a post-town in Hillsborough county, New Hampshire, watered by the Contoocook, eighteen miles west of Amherst, thirty-eight south-west of Concord, and sixty-four north west of Boston. This is one of the most considerable manufacturing towns in the state, and contains an oil mill, a paper mill, a woollen manufactory, and five cotton manufactories.

Peterborough, a town of Ireland, in Monaghan county, and province of Ulster.

PETERHEAD, a town of Scotland, in the county of Aberdeen, about thirty-three miles north-east of that city. It stands on the most easterly point in Scotland, and from thence due west that kingdom is broadest. It is the nearest land to the northern continent of Europe, and lies within 300 miles of the cape, which is called the Naze of Norway. Through this channel the grand body of the herrings pass in their annual migrations from Shetland and the north seas to the more southern latitudes, attended with the all-devouring cod and ling. The peninsula on which the town is built is connected with the main land on the north-west by an isthmus not more than 800 yards wide. Few harbours in Great Britain are of more importance to navigation than Peterhead, as, in case of violent storms from the easterly points, large vessels embayed betwixt this and the mouth of the Forth have not a port that they can safely take at every time of the tide, that of Aberdeen excepted. If, therefore, they cannot make their way to sea in the teeth of a strong easterly wind, or double this headland that they may gain the Murray frith, they must inevitably come on shore. This harbour lies in a spacious bay, where vessels of any burden may ride in all other winds, and is therefore a frequent rendezvous of shipping which frequent the northern seas. It is defended by a good battery. A considerable trade is carried on directly to the Baltic for deals, iron, hemp, tar, and other articles. There are also manufactures of sewing thread, woollen cloth, and cotton. A mineral well gives, in summer, considerable gaiety to the place; its salutary virtues have long, and very justly, been celebrated. An analysis of this water has been given by Dr. Laing; who found that one pound avoirdupois contains grs. $30\frac{3}{4}$ muriate of iron; grs. 7 muriate of lime; grs. $3\frac{1}{2}$ carbonate of iron; grs. 2 siliceous earth; grs. 2 sulphate of lime; grs. $1\frac{3}{4}$ sulphate of soda; grs. $7\frac{1}{2}$ muriate of soda; and $83\frac{1}{2}$ cubic inches of carbonic acid gas. This water has long been in great repute for disorders of the stomach and bowels, gravel, dropsy, nervous affections, female complaints, scrofula, leucophlegmasia, and diseases of general debility. The town is in the form of a cross, and is divided into four districts. The town house is an elegant building at the head of the principal street; sixty feet long, forty broad, with a fine clock, and a spire 100 feet high. It cost about £2000. The late improvements of the piers have cost several thousand pounds. The Keith Inch divides the harbour into north and south, and the pier here has never been overflowed. The south is considered the more convenient harbour. The commissioners for highland roads and bridges are expending large sums of money in forming a communication between the north and south harbours, and in effecting other great and valuable improvements. Ship-building is carried on to a great extent, and the fisheries are beginning to be much more attended to than formerly. It has many elegant houses on its borders. Near it is a fort and a guard house, with a battery of four twelve-pounders, and four eighteen-pounders. Peterhead is a burgh of barony, governed by a bailie and eight councillors. There are many convenient houses for the accommodation of strangers. There is a ball-room, under which there are two salt-water baths. The church, episcopal chapel, and burgher and antiburgher meetings, are also respectable. Owing to the open and peninsulated situation, the air of this place is esteemed peculiarly pure and healthful; even the fogs rising from the sea are thought to be medicinal: the town is therefore much enlivened by the concourse of company.

PETER-PENCE was an annual tribute of one penny, paid at Rome out of every family at the feast of St. Peter. This Ina, the Saxon king, when he went in pilgrimage to Rome about the year 740, gave to the pope, partly as alms, and partly in recompence of a house erected in Rome for English pilgrims: and this continued to be paid generally until the time of king Henry VIII., when it was enacted that, from henceforth, no persons shall pay any pensions, Peter-pence, or other impositions, to the use of the bishop or see of Rome.

PETERS (Father), a Jesuit, was confessor and counsellor to James II. king of England. This prince dismissed him in 1688, because he was considered as the author of those troubles in which the kingdom was then involved.

PETERS (William), was a native of the west of England, and, after a liberal education, became a student of Exeter College, Oxford; where, in 1788, he took the degree of bachelor of civil law. Previous to this, he studied painting with great assiduity, and obtained a place in the Royal Academy. But, on taking orders, he relinquished the pencil, except by way of amusement, and to oblige some particular friends. He painted historical subjects and portraits with great credit; among the latter was a whole length portrait of George IV. when prince of Wales, for Free-Masons' Hall, in Great Queen Street. Several engravings have been published from his paintings, particularly one of the Soul of an Infant carried to Heaven by Angels. Mr. Peters was presented by the late duke of Rutland, his patron, to a valuable living, and the bishop of Lincoln gave him a prebendal stall in his cathedral. He died at Brasted Place, in Kent, in April, 1814. Before the revolution in France he visited the continent, and while at Paris our ambassador requested the unfortunate Maria Antoinette to allow Mr. Peters to paint the portrait of the dauphin. A council was held upon it, but it was seriously decided that the effluvia of the paint would be injurious to the royal infant, and a refusal, assigning that as a reason, was communicated to his excellency.

PETERS (Charles), author of a Critical Dissertation on the Book of Job, was presented by Elizabeth, lady Mohan, to the living of Boconnoc, in Cornwall, in 1715, and resided there till 1727, when he obtained that of St. Mabyn, in the same county, where he resided till his death in 1777. He was the friend and correspondent of bishop Lowth, who, in his letter to Warburton, speaks highly of him.

PETERS (Hugh), a fanatic in the reign of Charles I., was the son of a merchant of Fowey, Cornwall, and educated at Trinity College, Cambridge. He took the degree of M.A. in 1622; but, it is said, was ultimately expelled his college for bad conduct. He then went on the stage, but afterwards took orders, and was lecturer of St. Sepulchre's, in London. Being here prosecuted for an intrigue with a married female, he absconded to Rotterdam, and became pastor of the English church. He subsequently went to America, where he remained seven years, and then returned to England. He was one of the most useful tools of Cromwell, owing to his talent for the burlesque, and extreme popularity with the soldiers and lower classes. When the king was brought to London for trial, Peters, says Sir Philip Warwick, was 'really and truly his jailor.' He was vehement for the execution of Charles, and suffered, after the Restoration, as a regicide. Some of his Discourses, and his Last Legacy to his Daughter, have been printed.

PETER'S ISLAND (St.), in the lake of Bienne in the Helvetic republic, remarkable for being one of the retreats of Rousseau; whence it has also got the name of Rousseau's Island. It lies towards the south side of the lake, and commands very delightful views. There is only one farm-house on the island, in an apartment of which Rousseau was lodged.

PETER'S LAKE (St.), a lake of Canada, twenty miles in length and about fifteen in breadth, is formed by the waters of the St. Laurence, aided by several considerable rivers, expanding over a level country. The lake is in general shallow, and in the ship channel there is not usually found more than from eleven to twelve feet water. Vessels of a considerable draught, instead of taking in their whole cargo at Montreal, take in only such part of it as they can carry across this lake, and take the remainder below the lake from river craft.

PETERSBURG, or ST. PETERSBURG, a city of Russia, in the province of Ingria, and capital of the empire. It was founded in 1703 by Czar Peter the Great, whose ambition it was to have a fleet on the Baltic; for which reason he determined to found a city which might become the centre of trade throughout all his dominions. The spot he pitched upon was a low, fenny, uncultivated island, formed by the branches of the Neva, before they fall into the gulf of Finland. In the summer this island was covered with mud; and in winter became a frozen pool, rendered almost inaccessible by dreary forests and deep morasses, the haunts of bears, wolves, and other savage animals. Having taken the fort of Nattebourg, and the town of Neischanz, in 1703, Peter assembled in Ingria above 300,000 men, Russians, Tartars, Cossacs, Livonians, and others, even from the most distant parts of his empire, and laid the foundation of the citadel and fortifications, which were finished in four months, almost in despite of nature. He was obliged to open ways through forests, drain bogs, raise dikes, and lay causeways, before he could found the new city. The workmen were ill-provided with necessary tools and implements: they were even obliged to fetch the earth from a great distance in the skirts of their garments, or in bags made of old mats and rags sewed together. They had neither huts nor houses to shelter them from the severity of the weather: the country, which had been desolated by war, could not accommodate such a multitude with provisions; and the supplies by the lake Ladoga were often retarded by contrary winds. In consequence of these hardships above 100,000 men are said to have perished; nevertheless the work proceeded with incredible vigor and expedition; while Peter, for the security of his workmen, formed a great camp, in such a manner that his infantry continued in Finland, and his cavalry were quartered in Ingria. The buildings of the city kept pace with the fortress, which is the centre of the town, surrounded on all sides by the Neva; and in little more than a year above 30,000 houses were erected. To people this city Peter invited merchants, artificers, mechanics, and seamen from all the different countries of Europe: he demolished the town of Nieuschants, and brought hither not only the materials of the houses, but the inhabitants themselves. A thousand families were drawn from Moscow; he obliged his nobility to quit their palaces and their villas in and about Moscow, and take up their residence at Petersburg, in a much more cold and comfortless climate. Finally, resolving to remove hither the trade of Archangel, he issued an ordonnance, importing that all such merchandise as had been conveyed to Archangel, to be sold to foreigners, should now be sent to Petersburg, where they should pay no more than the usual duties.

At first many houses were built of timber; but, these being subject to sudden conflagrations, the czar, in 1714, issued an order that all new houses should be walled with brick and covered with tiles. The fort is an irregular hexagon, with opposite bastions. This, together with all the rest of the fortifications, was in the beginning formed of earth only; but in the sequel they were faced with strong walls, and provided with bomb-proof casemates. In the curtain of the fort, on the right hand side, is a noble dispensary. The most remarkable building within the fort is the cathedral, built by the direction of an Italian architect. Petersburg is partly built on little islands, some of which are connected by draw-bridges; and partly on the continent. In the highest part, on the bank of the Neva, the czar fixed his habitation, built of freestone, and situated so as to command a prospect of the greater part of the city. Here likewise is a royal foundry; together with the houses of many noblemen. On the other side of a branch of the Neva stands the czar's summer palace, with a fine garden and orangery. Petersburg is very much subject to dangerous inundations. In 1715 all the bastions and drawbridges were either overwhelmed or carried away.

It was found extremely difficult, if not impracticable, to join the islands and the continent by bridges: and the adjacent country is so barren that the town must be supplied with provisions from a great distance; consequently they are extremely dear. In winter the weather is extremely cold, and hot in the summer. Peter the Great established in the neighbourhood manufactures of linen, paper, saltpetre, sulphur, gunpowder, and bricks, together with mills for sawing timber. He instituted also a marine academy, and obliged every considerable family in Russia to send at least one son or kinsman, between the ages of ten and eighteen, to this seminary. To crown his other plans of reformation, he granted letters patent for founding an academy, upon a very liberal endowment; and, though he did not live to execute this scheme, his empress, who survived him, brought it to perfection. It was modelled on the plans of the Royal Society in London, and the academy of France. The whole city is, at present, divided into four parts: 1. The Admiralty quarter; 2. The Vassali Ostroff, or island; 3. The Island of St. Petersburg; 4. The district of Wiburgh and 5. The Foundry district. These are subdivided into eleven smaller divisions, over each of which is placed a major of police.

Mr. Wraxall calls St. Petersburg in his time 'only an immense outline, which will require future empresses, and almost future ages, to complete.' The streets in general, says Mr. Coxe, are broad and spacious; and three of the principal ones, which meet in a point at the admiralty, and reach to the extremities of the suburbs, are at least two miles in length. Most of them are paved; but a few of them are still suffered to remain floored with planks. In several parts of the metropolis, particularly in the Vassali Ostrof, wooden houses and habitations, scarcely superior to common cottages, are blended with the public buildings; but this motley mixture is far less common than at Moscow, where alone can be formed any idea of an ancient Russian city. The brick houses are ornamented with a white stucco, which has led several travellers to say that they are built with stone; whereas, unless I am greatly mistaken, there are only two stone structures in all Petersburg. The one is a palace, building by the empress upon the banks of the Neva, called the marble palace; it is of hewn granite, with marble columns and ornaments; the other is the church of St. Isaac, constructed with the same materials, but not yet finished. The mansions of the nobility are many of them vast piles of building; they are furnished with great cost, and in the same elegant style as at Paris or London. They are situated chiefly on the south side of the Neva, either in the admiralty quarter, or in the suburbs of Livonia and Moscow, which are the finest parts of the city.' Mr. Coxe calculates the number of inhabitants in Petersburg at 130,000. An equestrian statue of Peter I. in bronze, of a colossal size, the work of M. Falconet, the celebrated French statuary, was cast at the expense of Catharine II. in honor of her great predecessor. Mr. C. gives a particular description of it. The statue was erected on the 27th of August, 1782, upon a pedestal of a most prodigious magnitude; the stone when landed (a labor of six months) being forty-two feet long at the base, thirty-six at the top, twenty-one thick, and seventeen high; a bulk greatly surpassing in weight the most boasted monuments of Roman grandeur. 'The weather,' he adds, 'is extremely changeable in this capital, and the cold is at times extreme. It sometimes happens that coachmen or servants, while they are waiting for their masters, are frozen to death. To prevent these dreadful accidents great fires of whole trees, piled one upon another, are kindled in the court-yard of the palace and the most frequented parts of the town.'

The first Admiralty quarter, is the smallest but most elegant division of Petersburgh. Within its circuit are twenty-three structures of the first magnitude. The Imperial Winter Palace is the most celebrated. It is 450 feet long, 380 broad, and seventy high; and in it is deposited an immense variety of curious and costly works of all descriptions. Connected with it, by means of a covered gallery, is the hermitage, a spacious edifice, so called from its being the scene of imperial retirement; it was built by Catharine II., and contains a valuable collection of paintings, including the original collection of Houghton house, Norfolk, and a cabinet of natural history. The next building in this quarter of the town worthy of notice is the marble palace already noticed. Few buildings in any part of Europe surpass this in magnificence; it is three stories high, the lowermost of granite, the superstructure of gray marble, decorated with columns and pilasters of a reddish marble. Nothing in the exterior presents itself to the eye but stone or metal; the window-frames are of brass highly polished; the roof rests on iron bars, and is covered with sheet copper. The whole forms an oblong quadrangle. It is situated on the quay of the Neva. It was built originally for Gregory Orloff, one of the favorites of Catharine II., and at his death reverted to that empress. In this quarter are the admiralty, the office for foreign affairs, the post-offices, the senate-house and the loan-bank.

The church of St. Isaac in this quarter was begun by Catharine II. Like the marble palace, the basement is granite, and the superstructure of marble, jasper, and porphyry, both within and without. It was one of the freaks of Paul to finish it with brick. The three straight, long, and beautiful streets of this quarter are called perspectives, because from each may be seen the gilded spire of the admiralty. Of these, the Nevski perspective is the most remarkable: there is in it only one little turn, and it is at least half as wide again as Oxford Street in London. 'The numerous hotels and the shops,' says Storch, 'which are mostly placed together in this street, occasion such a confluence of people, and such a constant bustle, that give it a consequence that is wanting to most parts of St. Petersburg. But, though the Nevski perspective is so remarkable for all these advantages, it becomes infinitely more so in the sight of the philosophical spectator, as the monument of a wise and enlightened toleration. One church here is concatenated with another: Protestants, Catholics, Lutherans, Armenians, and Greeks, have in this street their several churches beside and facing each other.' The equestrian statue of Peter the Great is in this quarter.

The public edifices of the second Admiralty quarter are, the new court stables, the college of medicine, and the opera-house. Two of the most considerable Greek churches are also within this quarter; that of Notre Dame of Cazan, and St. Nicholas. The former merits a particular description. It was originally built in 1734 by the empress Anne; the dome being then of wood, and its architecture ill corresponding to that of the more modern edifices near it. Here the Russian sovereigns, however, returned thanks for the prosperous events of their reigns, and it was determined to rebuild it. The emperor Paul, accordingly, in 1800, ordered plans for this purpose to be submitted to him; but, the death of that emperor occurring, the execution devolved on the late autocrat. It was consecrated 15th of September 1811. In every respect it is magnificent and rich: the door before the principal altar, and the balustrade around it, are of massy silver. The jaspers and marbles of Olonetz and Siberia are employed in great profusion, both in the mosaic and other ornaments. Its exterior is very rich: there is a colonnade of 150 columns of the Corinthian order; their bases and chapiters of cast iron. The portico is adorned with two bronze statues of the archangels, Gabriel and Michael. The principal external door is also of bronze: a perfect copy of the famous door of the cathedral of Florence. Every material employed in the construction and ornamenting of this church is the production of the empire; and almost all the artists, architects, painters, and sculptors were Russians. It is very rich in precious stones, and gold and silver vessels.

Of the third Admiralty quarter, the new bank, perhaps the most elegant building in St. Petersburg, is the chief ornament. Its architecture is simple, but the workmanship of the very first order: its roof is covered with plates of iron. It consists of three distinct compartments: two covered corridors connecting the main building with the sides.

The Vassili Ostroff, the largest island in the Neva, is only inhabited on the eastern or smaller part; the rest is covered with gardens, trees, and morass. Three principal streets traverse it from east to west, intersected at right angles by twelve smaller ones. This division is the seat of commerce and of learning, the exchange and the Academy of Sciences being in it. The building in which the meetings of the latter are held is an elegant structure. The edifices of the land-cadet corps are also in this island. Towards the isle of St. Petersburgh are the custom-house and the new exchange; the latter was finished in the reign of Alexander. The Lutheran church of St. Catharine, designed partly from the model of the temple of Concord, is the most remarkable in this division of the city.

The Petersburgh quarter consists of several islands, little built upon: it contains the first wooden cottage of Peter the Great.

The Wiburg quarter contains, beside the street along the right bank of the Neva, the cottages of the peasantry; there are also two grand mansions within its precincts, besides the great military hospital founded by Peter the Great, and some other public buildings of less magnitude. It also contains a wharf for merchant-ships.

The division of the Foundry is so called from a foundry established there: the most remarkable edifices and establishments in it are, the institute of Catharine for the education of young ladies, the convent of the resurrection for the same purpose, the great magazine for spirituous liquors and salt, the arsenal, and the Taurida palace. This, originally the pantheon of prince Potemkin, was purchased on his death by Catharine for her autumnal palace: it is remarkable for its vast galleries, its winter garden, its English garden, and its grotto formed of mirrors. The convent of St. Alexander Newsky adorns this quarter: it has, without its precincts, a large dwelling for the archbishop of Petersburg, a seminary, five churches, a cemetery, and a garden.

The mechanism of the bridges over the Neva is so simple that they can be taken to pieces in less than two hours, and this is done as soon as the floating ice at the beginning of the winter comes down: when the ice is fixed, they are again put up; and are taken down a second time at the breaking up of the ice in spring. But the ice, which continues firm, and capable of supporting any weight for five or six months, forms the principal communication in winter between the different quarters. Several plans have been formed for the erection of a permanent bridge across the Neva, but the practicability of such a measure seems doubtful. A wall, parapet, and pavement of hewn granite, stretch along the south bank of the river for three miles. This, which forms the quay, is one of the most striking and stupendous works by which this city is characterised. The triangle of edifices on the left side of the Neva is intersected by three principal canals, forming irregular semicircles, one within another. The Moika forms the smallest semicircle; the Katarina Canal embraces this; and the Fontanka includes both.

The waters of the Neva seem, after the first foundation of the city, to have risen usually every five years. On the 1st of November, 1726, they rose eight feet two inches; on the 2d of October, 1752, eight feet five inches. On September 10th, 1777, there was a dreadful inundation following a violent storm of wind from the west and south-west. In several streets, the torrent was four feet and a half deep, and so powerful that it carried away various buildings and bridges: the Vassili Ostroff and the Island of St. Petersburg particularly suffered. For a short time the river rose ten feet above its general level. After this inundation precautionary measures were taken to warn the inhabitants of the approaching evil. The height of the water is regularly marked: whenever it rises above its banks, at the mouth of the great Neva, notice is given by firings of cannon, repeated at intervals as the danger increases: five cannon are also fired at the Admiralty battery: and from its steeple, by day, flags are displayed, and lanterns by night, the bells of the churches tolling at the same time. These precautions, however, but ill prepared this great city for another calamity of this kind, November 1824. On the night of the 10th, a strong westerly wind impeded the current from the Ladoga Lake; the Neva and the canals rose to an unusual height, and lamps were hung out around the the admiralty steeple to warn the inhabitants not to sleep in their lowest apartments. It was soon apparent that all the admonitions prescribed were necessary; the Neva rose so as to inundate the whole city, and the confusion and destruction became indescribable. 'Vehicles of all descriptions,' says a private letter, 'were now seen hurrying homewards, or to the bridges, or to some rising ground, with the water over the wheels; people were also seen wading through it up to their waists; in a short time, only a courier here and there appeared on horseback, their horses scarcely able to keep their heads above the water. At one o'clock on the 19th nothing was to be seen on the Grand Place and in the streets, but wooden barks, empty boats, sentry-boxes, timber, furniture washed from the houses, bread, and various kinds of provisions, all floating in confused masses on the surface; wooden houses were seen floating up the river, most of the inhabitants of which had perished! Even the churchyards experienced an additional desolation. In the Smolensko quarter of the town, the coffins were washed out of their graves, and the dead bodies were cast up from their quiet habitations. Numbers had struggled up pillars, to the tops of the trees, and on the highest eminences, and were gradually saved from the fate of their companions by a few boats, which literally plied above the roofs of many of the houses! An eye-witness says, 'On Saturday the 20th, at day-break, I went out to view the effects of this catastrophe. I found the quay of the Neva blocked up with timber, broken barges, galliots, and vessels of various descriptions, which had carried with them the pillars and lamp-posts of the houses and had broken in the windows, and otherwise damaged the edifices on the quay. The large blocks of granite, of which the parapet is composed, were thrown over. The St. Isaac's, the Toochkoff, and summer garden bridges, were broken away from their anchors, and dispersed and destroyed. Many of the streets were so choked up with their timber as to be almost impassable. In the Vassili Ostroff quarter, where most of the houses are of wood, the destruction was immense; whole dwellings were hurled from their foundations, some of which were found at a considerable distance from the spot on which they stood, with the dead bodies of their unfortunate inhabitants within; others were broken into pieces on the spot, and some of them have been so totally destroyed that not a fragment of them remains.' Wooden barracks with many of their inmates were totally overwhelmed: an entire regiment of carabineers who had climbed up the roofs of one of them all perished! Eight thousand dead bodies had been already found, and multitudes were carried by the retreating waters down the gulf of Finland; many, also, were supposed to remain buried in the ruins of their habitations. Of course many instances of individual affliction, during the rapidity of the inundation, must have occurred; the following seems to us particularly affecting:—A lady and child in a carriage were in a dangerous situation, when a Cossac riding by observed her distress, and stopped; she entreated him at all hazards to save the child; he took it from the carriage window, but in a few minutes his horse slipped, and they both perished; soon afterwards the lady, with her servants, horses, and baggage, were overwhelmed in the waters. When we state the loss of human beings as already ascertained to have amounted to upwards of 8000, it may seem almost unfeeling to think of estimating the destruction of property; but many of those who have escaped the flood are doomed, in the wreck of their all, to combat the more tedious mortality of famine. All the provisions in the city had been more or less damaged, and the frost had set in so severely that any supply from sea was considered almost hopeless. The exchange had been fitted up to receive

4000 persons; and such of the public buildings as escaped were opened for the reception of the homeless. The number of these is beyond all present calculation. Our readers may, however, form some faint idea of it from the fact that whole villages in the neighbourhood of the city had almost entirely disappeared: of Emilianowka not a trace remained! The imperial establishments at Cronstadt suffered greatly, and the fleet sustained irreparable damage: a ship of 100 guns was left in the middle of one of the principal streets! In the imperial iron manufactory at Catharinoff 200 workmen perished; and out of eighteen barracks no less than fifteen were washed away. Such are a few, and but a few, of the results of this dreadful calamity. Alexander was a helpless witness of the scene from his palace windows: what a lessen for human ambition! A few years before an emperor, as powerful and as seemingly secure, found the grave of his fortune in the ruins of the other capital. To do him justice he seems to have been deeply afflicted at the spectacle; but indeed what indifferent sojourner would not? A million of roubles have been subscribed from the imperial purse, and a committee appointed for their immediate distribution; the reigning family have personally visited and succoured the miserable survivers; and all that human charity can do, under such a visitation, is in active progress.' The loss of commercial property was immense: of sugar alone 10,800,000 lbs. were damaged.

On an average of ten years, it is calculated, that there are here annually ninety-seven bright days, 104 rainy, seventy-two of snow, and ninety-three unsettled and changeable. The storms are frequent and violent. The greatest heat experienced during the latter sixty years of the eighteenth century was 27°, and the greatest cold 33°, of Reaumur. The spring is very short; the ice of the Neva never breaks up before the 25th of March, nor later than the 27th of April. The earliest time of its freezing is the 20th of October; the latest the 1st of December. It is not till May, however, that winter departs altogether; then the scene suddenly changes, and in a very few days the fields and the trees are green. The summer, in general, is as mild and agreeable as in the south of France, but much more variable and rainy. It is also very short. To it succeeds the most unpleasant season of the year, in no respect resembling the delightful autumns of most of the other countries of Europe. Dark heavy clouds conceal the sun for several weeks; incessant rains render the streets almost impassable; and storms frequently occur.

The population of St. Petersburgh amounted, in 1817, to 285,000 souls: of these 55,000 were connected, directly or indirectly, with the land and sea service, and 25,000 foreigners. There are no important manufactures as yet established: but the commerce is great, and principally in British hands. The imports are English manufactures and colonial produce; wines, fruit, and oils of the south of Europe; fine linens of Holland and Silesia; and the silks, watches, toys, &c., of France. The exports consist chiefly of iron, hemp, potash, flax, tallow, sail-cloth, cordage, hogs' bristles, furs, tars, isinglass, &c. By means of the canals of Ladoga and Vyshnei Voloshok, which unite the Baltic and the Caspian, goods are conveyed to the capital through a tract of 1434 miles without once landing them. This navigation begins at St. Petersburgh by the Neva, which issues from lake Ladoga. By a canal uniting the Volchof, which falls into the same lake, with the Tvertza, which falls into the Volga, the communication between the Baltic and the Caspian is effected. The canals of Ladoga and Vyshnei Voloshok likewise enable St. Petersburgh to receive the produce of China and Siberia. Petersburgh is 300 miles north-east of Stockholm, 355 north-west of Moscow, 540 N. N. E. of Warsaw, 525 north-east of Copenhagen, and 750 north-east of Vienna.

Petersburg, a borough and port of entry, Dinwiddie county, Virginia, on the south bank of the Appomatox, just below the falls, twelve miles above its junction with James River, at City Point, twenty-five miles south by east of Richmond. It contains a court house, a jail, a masonic hall, two banks, one insurance office, an academy which had, in 1818, upwards of 100 students; twelve or fourteen tobacco warehouses, eight flour mills, and five houses of public worship, one for Presbyterians, one for Episcopalians, one for Methodists, and two for Baptists. It is one of the handsomest and most commercial towns in the state, and has a large trade in tobacco and flour. The shipping owned here, in 1816, amounted to 5754 tons. The Appomatox is navigable as far as the town for vessels carrying 100 tons. The borough contains, besides the town of Petersburg, the village of Blandford in Prince George county, and Pocahoubar in Chesterford county.

PETERSFIELD, a borough and market-town of Hampshire, on the Loddon, seventeen miles north-east of Portsmouth, and fifty-five south-west of London. It sends two members to parliament. The town was incorporated by queen Elizabeth, and there is a good market on Saturdays.

PETHERTON, North, a parish in the hundred of the same name, Somerset, three miles south from Bridgewater, and 141 from London. It consists principally of one long street, of which many of the houses are well built; the parish is very extensive, including seventeen villages, and formerly had a considerable corn market on Saturday. Fair 1st May.

Petherton, South, a market town and parish, situate on the river Perret, over which there is a good stone bridge, twelve miles south-east from North Petherton, and 137 from London. The chief manufacture is that of dowlas. Market on Thursday. Fair 5th July.

PETHION De Villeneuve (Jerome), a French revolutionary leader, was originally an advocate at Chartres, and deputy from the Tiers Etat of the bailliage of that city to the States General. In the early part of his public career he acted with Mirabeau, but did not join in all the measures of that demagogue. October, 1789, he was appointed a member of the first Committee of General Safety; and on the 4th of December, 1790, president of the National Assembly. In June following he became president of the Criminal Tribunal of Paris; and was, together with Barnave and Latour Maubourg, a commissioner to attend the return of Louis XVI. from Varennes. On this occasion Pethion is said to have behaved with little attention to his captives. He was elected to the office of mayor of Paris, November 14th, 1791; and, in consequence of his supposed implication in the riotous attack of the Parisian mob on the Tuilleries on the 20th of June, 1792, was suspended from his functions by the king on the 6th of July, but restored by the Assembly on the 13th. His behaviour on the 10th of August has by some been interpreted as the result of irresolution, and by others as the effect of design, to avoid betraying his real character as an abettor of violence. He now took an active part in the imprisonment of the royal family, and other measures of the ruling party, and became the first president of the Convention. After the death of the king, Pethion was accused of having contributed to the massacres of the Septembrizers; but against this charge he defended himself: he became, however, the peculiar object of jealousy to Robespierre; and, being included in the proscription of the Girondists, was confined in his own house, in the custody of a gendarme, from which he contrived to make his escape, with some other deputies of the same party. He took refuge in the department of Calvados, where they in vain endeavoured to avail themselves of the insurrections against the terrorists: some time after his body, with that of Buzot, one of his confederates, was found in a field half devoured by wolves! He is supposed to have perished with hunger. His works, 4 vols. 8vo., were printed in 1793.

PETIOLE, in botany, the slender stalks that support the leaves of a plant.

PETIOLUS. See BOTANY, Index.

PETION (Alexander Sabes), the late president of the black republic of Hayti, was born at Port-au-Prince, April 2d, 1770. Being the son of a colonist who possessed considerable property, he received a liberal education; and he was scarcely twenty years old when the revolutionary commotions broke out in the island. He was one of the first who took arms; was made an officer of artillery; and obtained the rank of adjutant-general during the civil wars. After the English had left the island, Petion joined Rigaud, a man of color like himself, in opposing the projects of Toussaint L'Ouverture. Rigaud, being unsuccessful, embarked for France with Petion. They both returned to Hayti, however, with general Leclerc, under whom Petion held a colonel's commission. The violent measures adopted by Leclerc and Rochambeau induced Petion to quit the French service; and, forming a union with the negro general Dessalines, assisted by the English, they succeeded in establishing the independence of Hayti in 1804. Petion obtained the government of the western district, while Dessalines, becoming chief of the republic, assumed the title of emperor; until, his conduct having given offence, he was assassinated in 1806. Christophe, his lieutenant, was elected president of Hayti by the senate, but he chose rather to take the title of king, and, behaving in a tyrannical manner, he was obliged to submit to a partition of his dominions. All the southern and western part of the island acknowledged the authority of the senate, by whom Petion was elected president, January 27th, 1807. A civil war now took place between the rivals, but Petion retained his office till his death in 1818, when he was succeeded by his lieutenant, general Boyer.

PETIS DE LA CROIX (Francis), a learned French writer, who was sent into Turkey and Persia, at the age of sixteen, to learn the oriental languages; and became interpreter to Louis XIV., by whom he was employed in various negociations. He wrote part of the life of Louis XIV. in Arabic, a work much esteemed in the east. He died in 1713. He is mentioned with approbation by Voltaire. He understood the Arabic, Turkish, Persian, Tartarian, Ethiopian, and Armenian languages.

PETIT, *adj.* French, *petit*. Small; inconsiderable.

> By what small *petit* hints does the mind recover a vanishing motion! — *South.*

PETIT TREASON. See TREASON.

PETIT (John), a doctor of the Sorbonne, who very early gained a high character by his eloquent orations pronounced before the university of Paris. He was employed in the famous embassy which was sent from France to Rome, for the purpose of healing the schism in 1407: but what chiefly procured him notoriety was his defence of the murder of Louis, duke of Orleans, only brother to Charles VI.; maintaining, in a public disputation at Paris, the 8th of March 1408, that the murder was lawful, and that 'it is allowable to employ fraud, treason, and every other method, however base, to get rid of a tyrant.' Petit died in 1511, at Hesdin.

PETIT (John Louis), an eminent surgeon, born at Paris in 1674. He acquired such reputation, that in 1726 the king of Poland sent for him to his court, and in 1734 the king of Spain prevailed on him to go into that kingdom. He restored the health of those princes; and they endeavoured to detain him by offering him great advantages, but he chose rather to return to France. He was received into the academy of sciences in 1715; became director of the royal academy of surgery; made several important discoveries; and invented new instruments for the improvement of surgery. He died at Paris in 1750. He wrote an excellent Treatise on the Diseases of the Bones, the best edition of which is that of 1723; and many learned dissertations in the Memoirs of the Academy of Sciences, and in the Memoirs of Surgery, vol. i.

PETIT (Peter), an eminent French mathematician, born at Montluçon in 1589. By Richelieu's influence he became engineer to the king, and intendant of fortifications; and was sent into Italy on the king's business. He wrote several works upon physical and astronomical subjects, and died in 1667.

PETIT (Peter), M. D., a learned French physician, born at Paris in 1617. He graduated at Montpelier; but, preferring literary pursuits to medicine, he became preceptor to the sons of the president Lamoignon. He wrote many pieces in Latin prose and verse; and was deeply versed in Greek and Roman literature and philosophy. He died in 1687, aged seventy.

Petit (Samuel), a learned Frenchman, born at Nismes in 1564. He studied at Geneva, where he became professor of Greek, Hebrew, and theology. He published Leges Atticæ, Paris, 1615 and 1633.

PETITE Guerre denotes the operations of detached parties, and the war of posts. See War.

PETITIO Principii, in logic the taking a thing for true, and drawing conclusions from it as such, when it is really false, or at least wants to be proved before any inferences can be drawn from it.

PETITION, *n. s.* & *v. a.*
Petit'ionarily, *adv.*
Petit'ionary, *adj.*
Petit'ioner, *n. s.*
} Lat. *petitio.* Request; prayer; intreaty: to supplicate; request; intreat: petitionarily is an aukward adverb, used by Browne, to signify by way of begging the question: petitionary, supplicatory; containing petitions: petitioner, one who supplicates, or offers a petition.

Let my life be given at my *petition*, and my people at my request. *Esther* vii. 3.

Thou didst choose this house to be called by thy name, and to be a house of prayer and *petition* for thy people. 1 *Mac.* vii.

We must propose unto all men certain *petitions* incident and very material in causes of this nature. *Hooker.*

Petitionary prayer belongeth only to such as are in themselves impotent, and stand in need of relief from others. *Id.*

My next poor *petition*
Is, that his noble grace would have some pity
Upon my wretched women. *Shakspeare.*

Pardon thy *petitionary* countrymen. *Id.*

You have *petitioned* all the gods
For my prosperity. *Id. Coriolanus.*

When you have received the *petitions*, and it will please the *petitioners* well to deliver them into your own hand, let your secretary first read them, and draw lines under the material parts. *Bacon.*

It is our base *petitionary* breath
That blows 'em to this greatness. *Ben Jonson.*

This doth but *petitionarily* infer a dextrality in the heavens, and we may as reasonably conclude a right and left laterality in the ark of Noah. *Browne.*

It was no wonder that they, who at such a time could be corrupted to frame and deliver such a *petition*, would not be reformed by such an answer. *Dryden.*

His woes broke out, and begged relief
With tears, the dumb *petitioners* of grief. *Id.*

Their prayers are to the reproach of the *petitioners*, and to the confusion of vain desires. *L'Estrange.*

What pleasure can it be to be encumbered with dependencies, thronged and surrounded with *petitioners*? *South.*

The Roman matrons presented a *petition* to the fathers; this raised so much raillery upon the *petitioners* that the ladies never after offered to direct the lawgivers of their country. *Addison.*

I return only yes or no to questionary and *petitionary* epistles of half a yard long. *Swift.*

We must not only send up *petitions* and thoughts now and then to heaven, but must go through all our worldly business with a heavenly spirit. *Law.*

Methods had been taken to persuade the queen so strongly of the truth of it, that she for a long time refused to hear any one of those who *petitioned* for his life. *Johnson.*

The Hampshire *petition* arose out of the election occasioned by the dissolution. *Canning.*

Petition, in law, is a supplication made by an inferior to a superior, and especially to one having jurisdiction. It is used for that remedy which the subject has to help a wrong done by the king, who hath a prerogative not to be sued by writ: In which sense it is either general, that the king do him right; whereupon follows a general indorsement upon the same, Let right be done the party: Or it is special, when the conclusion and indorsement are special for this or that to be done, &c. By statute, the soliciting, laboring, or procuring the putting the hands or consent of above twenty persons to any petition to the king or either house of parliament, for alterations in church or state, unless by assent of three or more justices of the peace of the county, or a majority of the grand jury at the assizes or sessions, &c., and repairing to the king or parliament to deliver such petition with above the number of ten persons, is subject to a fine of £100 and three months' imprisonment, being proved by two witnesses within six months, in the court of B. R. or at the assizes, &c. And, if what is required by this statute be observed, care must be taken that petitions to the king contain nothing which may be interpreted to reflect on the administration; for, if they do, it may come under the denomination of a libel: and it is remarkable that the petition of the city of London for the sitting of a parliament was deemed libellous, because it suggested that the king's dissolving a late parliament was an obstruction of justice; also the petition of the seven bishops sent to the Tower by James II. was called a libel, &c. To subscribe a petition to the king, to frighten him into a change of his measures, intimating that if it be denied many thousands of his subjects will be discontented, &c., is included among the contempts against the king's person and government, tending to weaken the same, and is punishable by fine and imprisonment.

Petition of Right was a celebrated parliamentary declaration of the liberties of the people assented to by king Charles I., in the beginning of his reign: in which it is enacted that none should be compelled to make or yield any gift, loan, benevolence, tax, and such like charge, without consent by act of parliament; nor, upon refusal so to do, be called to make answer, take any oath not warranted by law, give attendance, or be confined, or otherwise molested concerning the same, &c. And that the subject should not be burdened by the quartering of soldiers or mariners; and all commissions for proceeding by martial law to be annulled, and none of like nature issued thereafter, lest the subject (by color thereof) be destroyed or put to death, contrary to the laws of the land, &c. See stat. 3 Car. I. cap. 1.

PETITOT (John), a curious painter in enamel born at Geneva in 1609. He arrived to a degree of perfection that may almost be accounted inimitable. He, however, only painted the heads and hands of the figures; the hair, grounds, and drapery, being executed by Bordier, his brother-in-law. These two artists had the credit of laboring together for fifty years in the greatest harmony. He painted the portraits of Charles I. and his family. He then went to Paris, where he was highly favored by Louis XIV. and acquired an ample fortune. Being a Protestant, the revocation of the edict of Nantes obliged him to retire to Geneva; but, settling soon after at Veray in Bern, he passed the remainder of his life in affluence. He died in 1691, and had seventeen children; of whom one took to painting, and settled at London, where he gained reputation; but was much inferior to his father. Petitot may be called the inventor of painting portraits in enamel. He made use of gold and silver plates, and seldom enamelled on copper. His price was twenty louises a head, which he soon raised to forty.

PETITPIERRE (Ferdinand Oliver), an eminent Protestant French divine, who flourished about the beginning of the eighteenth century. He was minister of a church in Chaux De Fond, and published a work entitled Thoughts on the Divine Goodness; divided into three chapters, containing the definition, proofs, and consequences, of the infinite goodness of God. This work has gone through many editions, and has been translated into English and other languages. But one of the chief tenets included in it, being, that the state of future punishment (which, however, he places in a most terrific point of view) is not eternal, and that all men will be finally happy, he was first prohibited from preaching, and afterwards deposed. A translation of this work was published at Edinburgh in 1799, 12mo.

PETIVER (James), F.R.S., an eminent English botanist, contemporary with Plukenet. He was bred an apothecary with Mr. Feltham, of St. Bartholomew's hospital; settled in Aldersgate Street, and became apothecary to the Charter House. He made a collection in natural history, so valuable that Sir Hans Sloane offered him £4000 for it before his death, and purchased it afterwards. He was elected F. R. S. and assisted Ray in the second volume of his History of Plants. He engaged the captains and surgeons of ships to bring him home specimens of foreign plants; and enabled them to select proper objects by printed directions. He wrote 1. Musæi Petiveriani centuriæ decem; 1692—1703; 8vo. 2. Gazophylacii Naturæ et Artis decades decem; fol. 1702, with 100 plates. 3. A Catalogue of Mr. Ray's English Herbal; fol. 1713 to 1715. 4. Many small tracts enumerated in Dr. Pultney's book. 5. Many papers in the Philosophical Transactions. 6. Plantæ rariores Chinenses, Madraspatanæ, et Africanæ, &c., in Ray's 3rd vol. His works were reprinted in 1764, in 2 vols. fol. and 1 vol. 8vo. He died the 20th of April 1718; and his funeral was honored by the literati.

PETIVERIA, in botany, Guinea-hen weed, a genus of the tetragynia order and hexandria class of plants; and in the natural method ranking under the twelfth order, holoraceæ: CAL. tetraphyllous: COR. none, and but one SEED, with reflexed awns at the top.

PETLAD, a town in the province of Gujrat, Hindostan, sixteen miles E. N. E. from Cambay. Lat. 22° 27′ N., long. 73° E. The caste of Dhers are here exempt from the general duty imposed on them in the rest of the province, of serving as guides; but a stranger may here seize on the first person he meets and compel him to act as such.

PETRA, a town of Greece, on the coast of Illyricum near Dyrrhachium and the mouth of the Panyasus. Cæs. Lucian.

PETRA, a town of Mædica, a district of Thrace, lying towards Macedonia; but in what part of Macedonia Livy does not say.

PETRA, PETRÆA, or PETRINA (urbs being understood), an inland town of Sicily, south-west of Engyum; now called Petraglia. Cluverius, Ptol. Sil. Ital.

PETRA was also the name of four other ancient towns: viz. 1. in Pieria in Macedon—Liv. Cæs. 2. Near Dyrrhachium.—Lucan. Cæs. 3. In Elis: and, 4. Near Corinth.

PETRA JECKTAEL, a town of the Amalekites, near the Adscensus Scorpionis, and the valley of Salt in the south of Judea; afterwards in the possession of the Edomites, after destroying the Amalekites. 2 Kings xiv.; Judges i.

PETRA RECEM, or REKEM, so called from Rekem king of the Midianites, slain by the Israelites, Numb. xxxi., a town of Arabia, formerly called Arce or Petra: the capital of Arabia Petræa.—Josephus. Ptolemy places it in long. 66° 45′ from the Fortunate Islands, and lat. 30° 20′. It declines eighty miles to the south of the parallel of Jerusalem, and thirty-six miles, more or less, from its meridian to the east; Josephus says that the mountain on which Aaron died stood near Petra; which Strabo calls the capital of the Nabatæi; at the distance of three or four days' journey from Jericho. This Petra seems to be the Sela of Isaiah xvi. 1, and xlii. 11, from the Hebrew name, Petra, a rock, but some imagine Petra to be no older than the time of the Macedonians.

PETRARCH (Francis), a celebrated Italian poet, born at Arezzo in 1304. He studied grammar, rhetoric, and philosophy, four years at Carpentras; whence he went to Montpelier, where he studied the law. His father and mother dying of the plague at Avignon, he returned to that city, when twenty-two years of age, to settle his domestic affairs, and purchased a country house in a very solitary but agreeable situation, called Vaucluse; where he first saw the beautiful Laura, of whom he became enamoured, and whom he has immortalised in his poems. He travelled into France, the Netherlands, and Germany; and, at his return to Avignon, entered into the service of pope John XXII., who employed him in several important affairs. Petrarch expected some considerable posts; but, being disappointed, he applied himself entirely to poetry; in which he met with such applause, that in the same day he received letters from Rome and Paris inviting him to receive the poetic crown. He preferred Rome, and received that crown from the senate and people on the 8th of April 1341. His love of solitude at length induced him to return to Vaucluse; but, after the death of the beautiful Laura, Provence became insupportable to him, and he returned to Italy in 1352; when, being at Milan, Galeas Viceconti made him counsellor of state. Petrarch spent almost all the rest of his life in travelling to and from the different cities in Italy. He was archdeacon of Parma, and canon of Padua; but never received the order of priesthood. All the princes and great men of his time gave him public marks of their esteem; and while he lived at Arcqua, three miles from Padua, the Florentines sent Boccace to him with letters, inviting him to Florence, and informing him that they restored to him all the estate of which his father and mother had been deprived during the dissentions between the Guelphs and the Gibelines. He died a few years after at Arcqua, in 1374. He wrote many works that have rendered his memory immortal; printed in four vols. folio. His life has been written by several authors; particularly by Mrs. Dobson, in 2 vols. 8vo. 'The works of Petrarch,' says Mr. Tytler, 'bear evidence of his abilities as a politician, theologian, and philosopher, and it is in these characters that he appears to have been chiefly distinguished by his contemporaries, but it is not on these foundations that the lasting structure of his fame has been reared. It is to those incomparable verses, in which he has celebrated the accomplishments and bewailed the fate of the beautiful Laura, that Petrarch has been indebted for his permanent reputation. The history of the poet's passion for his lovely mistress must ever be regarded as forming the most interesting portion of his annals. His character, in fact, took its tone from that predominant affection, which influenced his studies, his habits of life, and all his pursuits and occupations. A love so pure, so ardent, and so lasting, is difficult to be paralleled in the history of human nature. Petrarch was the passionate admirer of Laura for twenty-one years while she was in life, and with unabated ardor of affection he is said to have bewailed her loss for twenty-six years after her death.

PETRASTRUMIA, a town of Naples in Principato Ultra; nine miles south of Benevento.

PETRATSCHEN, a town of Prussian Lithuania, four miles W. S. W. of Ragnitz.

PETRE, *n. s.* Lat. *petra*, a stone. Nitre; salt-petre. Not of modern use.

Powder, made of impure and greasy *petre*, hath but a weak emission, and gives but a faint report. *Browne.*

The vessel was first well nealed to prevent cracking, and covered to prevent the falling in of any thing that might unseasonably kindle the *petre*. *Boyle.*

Nitre, while it is in its native state, is called *petre-salt*, when refined salt-*petre*. *Woodward.*

PETRE, or SALTPETRE, in chemistry. See CHEMISTRY, Index, and NITRE.

PETREA, in botany, a genus of the angiospermia order and didynamia class of plants; natural order fortieth, personatæ: CAL. quinquepartite; very large and colored: COR. rotaceous: CAPS. bilocular, and situated in the bottom of the calyx: SEED solitary. There is only one species, a native of New Spain. It rises to fifteen or sixteen feet, with a woody stalk covered with gray bark, sending out several long branches. These have a whiter bark than the stem, and are garnished with leaves at each joint, which, on the lower part of the branches, are placed by three round them; but higher up they are rough, and have a rough surface. The flowers are produced at the ends of the branches, in loose bunches nine or ten inches long, each flower standing on a slender flower-stalk about an inch long: the empalement of the flower is composed of five narrow obtuse leaves about an inch long, which are of a fine blue color, and much more conspicuous than the petals which are white, and not more than half the length of the empalement. The plant is propagated by seeds procured from the places where they are natives, and of which very few are good. The seeds must be sown in a good hot-bed; and, when the plants come up, they should all be planted in a separate small pot filled with light loamy earth, and plunged into a hot-bed of tanners' bark, where they should afterwards constantly remain.

PETRES'CENT, *adj.*
PETRIFAC'TION, *n. s.*
PETRIFAC'TIVE, *adj.*
PETRIFICA'TION, *n. s.*
PETRIF'IC, *adj.*
PET'RIFY, *v. a.* & *v. a.*

Lat. *petrescens*, *petrifio*. Growing or becoming stone; petrifaction, the act of turning to stone, or state of being so turned: petrifactive and petrific mean having the power of changing into stone or to form stone: petrification, the body formed by the change of matter into stone: to petrify is to convert into stone: hence to make hard or callous; stupify: as a verb neuter to become stone.

Though their souls be not yet wholly *petrified*, yet every act of sin makes gradual approaches to it. *Decay of Piety.*

Winter's breath,
A nitrous blast that strikes *petrifick* death. *Savage.*

The aggregated soil,
Death with his mace *petrifick*, cold and dry,
As with a trident, smote. *Milton's Paradise Lost.*

Its concretive spirit has the seeds of *petrifaction* and gorgon within itself. *Browne.*

There are many to be found, which are but the lapidescences and *petrifactive* mutation of bodies. *Id.*

A cave, from whose arched roof there dropped down a *petrescent* liquor, which oftentimes before it could fall to the ground congealed. *Boyle.*

In these strange *petrifications*, the hardening of the bodies seems to be effected principally, if not only, as in the induration of the fluid substance of an egg into a chick, by altering the disposition of their parts. *Id.*

Like Niobe we marble grow,
And *petrify* with grief. *Dryden.*

A few resemble *petrified* wood. *Woodward.*

Look over the variety of beautiful shells, *petrifactions*, ores, minerals, stones, and other natural curiosities. *Cheyne.*

Full in the midst of Euclid dip at once
And *petrify* a genius to a dunce. *Pope.*

Who stifle nature, and subsist on art,
Who coin the face, and *petrify* the heart. *Young.*

PETRIDIA, in the old system of mineralogy, a genus of scrupi, of a plain uniform texture; of no great variety of colors, and emulating the external form of pebbles.

PETRIFACTION, in physiology, denotes the conversion of wood, bones, and other substances, principally animal or vegetable, into stone. These bodies are more or less altered from their original state, according to the different substances they have lain buried among in the earth; some of them have suffered very little change, and others being so highly impregnated with crystalline, sparry, pyritical, or other extraneous matter, as to appear mere masses of stone, or lumps of the matter of the common pyrites; but they are generally of the external dimensions, and retain more or less of the internal figure, of the bodies into the pores of which this matter has made its way. The animal substances thus found petrified are chiefly sea-shells; the teeth, bony palates, and bones of fish; the bones of land animals, &c. These are found variously altered, by the insinuation of stony and mineral matter into their pores; and the substance of some of them is now wholly gone, there being only stony, sparry, or other mineral matter remaining in their shape and form.

Respecting the manner in which petrifaction is accomplished we know little. It has been thought by many philosophers that this was one of the rare processes of nature; and accordingly such places as afforded a view of it have been looked upon as great curiosities. However, it is now discovered that petrifaction is exceedingly common; and that every kind of water carries in it some earthy particles, which, being precipitated from it, become stone of a greater or less degree of hardness; and this quality is most remarkable in those waters which are much impregnated with selenitic matter. Of late, it has also been found that iron contributes greatly to the process; and this it may do by its precipitation of any aluminous earth which happens to be dissolved in the water by means of an acid. The calcareous kinds of earth, also, by being soluble in water without any acid, must contribute very much to the process of petrifaction, as they are capable of a great degree of hardness by means of being joined with fixed air, on which depends the solidity of our common cement or mortar used in building houses. The name petrifaction belongs only to bodies of vegetable or animal origin; and to determine their class and genus, or even species, it is necessary that their texture, their primitive form, and in some measure their organisation, be still discernible. Thus we ought not to place the stony kernels, moulded in the cavity of some shell, or other organised body, in the rank of petrifactions properly so called.

Petrifactions of the vegetable kingdom are almost all either gravelly or siliceous; and are found in gullies, trenches, &c. Those which strike fire with steel are principally found in sandy fissures; those which effervesce in acids are generally of animal origin, and are found in the horizontal beds of calcareous earth, and sometimes in beds of clay or gravel; in which case the nature of the petrifaction is different. As to the substances which are found in gypsum, they seldom undergo any alteration, either with respect to figure or composition, and they are very rare. Organised bodies, in a state of petrifaction, generally acquire a degree of solidity of which they were not possessed before they were buried in the earth; and some of them are often full as hard as the stones or matrices in which they are enveloped. When the stones are broken, the fragments of petrifications are easily found, and easily distinguished. There are some organised bodies, however, so changed by petrifaction as to render it impossible to discover their origin. That there is a matter more or less agitated, and adapted for penetrating bodies, which crumbles and separates their parts, draws them along with it, and disperses them here and there in the fluid which surrounds them, is a fact of which nobody seems to entertain any doubt. Indeed we see almost every substance, whether solid or liquid, insensibly consume, diminish in bulk, and at last, in the lapse of time, vanish and disappear. A petrified substance, strictly speaking, is nothing more than the skeleton, or perhaps image of a body which has once had life, either animal or vegetable, combined with some mineral. Thus petrified wood is not in the state wood alone. One part of the compound or mass of wood, having been destroyed by local causes, has been compensated by earthy and sandy substances, diluted and extremely minute, which the waters surrounding them had deposited while they themselves evaporated. These earthy substances, being then moulded in the skeleton, will be more or less indurated, and will appear to have its figure, its structure, its size, in a word, the same general characters, the same specific attributes, and the same individual differences. Farther, in petrified wood, no vestige of ligneous matter appears to exist. We know that common wood is a body in which the volume of solid parts is greatly exceeded by that of the pores. When wood is buried in certain places, lapidific fluids, extremely divided and sometimes colored, insinuate themselves into its pores and fill them up. These fluids are afterwards moulded and condensed. The solid part of the wood is decomposed and reduced into powder, which is expelled without the mass by aqueous filtration. In this manner the places which were formerly occupied by the wood are now left empty in the form of pores. This operation of nature produces no apparent difference, either of the size or of the shape; but it occasions, both at the surface and in the inside, a change of substance, and the ligneous texture is inverted; that is to say, that which was pore in the natural wood, becomes solid in that which is petrified; and that which was solid or full in the first state becomes porous in the second. In this way, says M. Musard, petrified wood is much less extended in pores than solid parts, and at the same time forms a body much more dense and heavy than the first. As the pores communicate from the circumference to the centre, the petrifaction ought to begin at the centre, and end with the circumference of the organic body subjected to the action of the lapidific fluids. Such is the origin of petrifactions. They are organised bodies which have undergone changes at the bottom of the sea or the surface of the earth, and which have been buried by various accidents at different depths under the ground. To understand properly the detail of the formation of petrified bodies it is necessary to be well acquainted with all their constituent parts. Let us take wood for an example. Wood is partly solid and partly porous. The solid parts consist of a substance, hard, ligneous, and compact, which forms the support of the vegetable; the porous parts consist of vessels or interstices which run vertically and horizontally across the ligneous fibres, and which serve for conducting air, lymph, and other fluids. Among these vessels, the trachiæ, which rise in spiral forms, and which contain only air, are easily distinguished. The cylindric vessels, some of which contain lymph and others the succus proprius, are full only during the life of the vegetable. After its death they become vacant by the evaporation and absence of the fluids with which they were formerly filled. All these vessels, whether ascending or descending, unite with one another, and form great cavities in the wood and in the bark. According to Malphigi and Duhamel, the ligneous fibres are themselves tubular, and afford a passage to certain liquors; in short, the wood and bark are interspersed with utriculi of different shapes and sizes. The augmentation of the trunk in thickness, according to Malpighi, is accomplished by the annual addition of a new exterior covering of fibres and of trachiæ. Others think that a concentric layer of sap wood is every year hardened, whilst a new one is formed from the bark. But it is on all sides agreed, that the concentric layers of wood are distinct from one another, because, at the point of contact betwixt any two of them, the new vessels, as well as new fibres, are more apparent and perceptible than they are in any other place.

In order, says M. Bertrand, in his Dictionnaire des Fossiles, that a body should become petrified, it is necessary that it be—1. Capable of preservation under ground: 2. That it be sheltered from the air and running water (the ruins of Herculaneum prove that bodies which have no connexion with free air preserve themselves untouched and entire). 3. That it be secured from corrosive exhalations. 4. That it be in a place where there are vapors or liquids, loaded either with metallic or stony particles in a state of dissolution, and which, without destroying the body, penetrate it, impregnate it, and unite with it, in proportion as its parts are dissipated by evaporation.

M. Mongez explains the petrifaction of vegetables as follows:—In proportion to the tenderness and bad quality of wood, it imbibes the greater quantity of water; therefore this sort will unquestionably petrify more easily than that which is hard. It is thought that all the petrified wood so often found in Hungary has been originally soft, such as firs or poplars. Suppose a piece of wood buried in the earth: if it be very dry it will suck up the moisture which surrounds it like a spunge. This moisture, by penetrating it, will dilate all the parts of which it is composed. The trachiæ, or air vessels, will be filled first, and then the lymphatic vessels, and those which contain the succus proprius, as they are likewise empty. The water which forms this moisture keeps in dissolution a greater or a less quantity of earth; and this earth, detached, and carried along in its course, is reduced to such an attenuated state, that it escapes our eyes and keeps itself suspended, whether by the medium of fixed air or by the motion of the water. Such is the lapidific fluid. Upon evaporation, or the departure of the menstruum, this earth, sand, or metal, again appears in the form of precipitate or sediment in the cavities of the vessels, which by degrees are filled with it. This earth is there moulded with exactness: the lapse of time, the simultaneous and partial attraction of the particles, make them adhere to one another; the lateral suction of the surrounding fibres, the obstruction of the moulds, and the hardening of the moulded earth, become general; and there consists nothing but an earthy substance which prevents the sinking of the neighbouring parts. If the deposit is formed of a matter in general pretty pure, it preserves a whiter and clearer color than the rest of the wood; and as the concentric layers are only perceptible and distinct in the wood, because the vessels are there more apparent on account of their size, the little earthy cylinders, in the state of petrified wood, must be there a little larger, and consequently must represent exactly the turnings and separations of these layers. At the places of the utriculi globules are observed, of which the shapes are as various as the moulds in which they are formed. The anastomoses of the proper and lymphatic vessels form, besides, points of support or reunion for this stony substance. With regard to holes formed by worms in any bits of wood before they had been buried in the earth, the lapidific fluid, in penetrating these great cavities, deposits there as easily the earthy sediment, which is exactly moulded in them. These vermiform cylinders are somewhat less in bulk than the holes in which they are found, which is owing to the retreat of the more refined earth, and to its drying up. Let any one represent to himself this collection of little cylinders, vertical, horizontal, inclined in different directions, the stony masses of utriculi and of anastomoses, and he will have an idea of the stony substance which forms the ground work of petrifaction. Hitherto not a single ligneous part is destroyed; they are all existing, but surrounded on every side with earthy deposite; and that body which, during life, was composed of solid and of empty parts, is now entirely solid; its destruction and decomposition do not take place till after the formation of these little deposits. In proportion as the water abandons them it penetrates the ligneous substance, and destroys it by an insensible fermentation. The woody fibres, being decomposed, form in their turn voids and interstices, and there remains in the whole piece nothing but little stony cylinders. But in proportion as these woody fibres disappear, the surrounding moisture, loaded with earth in the state of dissolution, does not fail to penetrate the piece of wood, and to remain in its new cavities. The new deposit assumes exactly the form of the decomposed fibres; it envelopes in its turn the little cylinders which were formed in their cavities, and ends by incorporating with them. We may suppose here that, in proportion as it decomposes, there is a reaction of the ligneous part against the lapidific fluid: from this reaction a color arises which stains more or less the new deposit; and this color will make it easily distinguishable from that which has been laid in the inside of the vessels. In all petrified wood this shade is generally perceptible. We have then, says M. Mongez, four different epochs in the process by which nature converts a piece of wood into stone, or, to speak more justly, by which she substitutes a stony deposit in its place:—1. Perfect vegetable wood, that is to say, wood composed of solid and of empty parts, of ligneous fibres, and of vessels. 2. Wood having its vessels obstructed and choked up by an earthy deposit, while its solid parts remain unaltered. 3. The solid parts, attacked and decomposed, forming new cavities betwixt the stony cylinders, which remain in the same state, and which support the whole mass. 4. These new cavities filled with new deposits, which incorporate with the cylinders, and compose nothing else but one general earthy mass representing exactly the piece of wood. Among the petrifactions of vegetables called dendrolites are found parts of shrubs, stems, roots, portions of the trunk, some fruits, &c. We must not, however, confound the impressions of mosses, ferns, and leaves, nor incrustations, with petrifactions. Among the petrifactions of animals, we find shells, crustaceous animals, polyparii, some worms, the bony parts of fishes and of amphibious animals, few or no real insects, rarely birds and quadrupeds, together with the bony portions of the human body. The cornua ammonis are petrified serpents; and with regard to figured and accidental bodies, these are lusus naturæ.

It is a question of great importance among naturalists to know the time which nature employs in petrifying bodies of an ordinary size. M. le Chevalier de Baillu, director of the cabinet of natural history of his imperial majesty of Austria, and some other naturalists, had, several years ago, the idea of making a research which might throw some light upon it. His majesty being informed by the unanimous observations of modern historians and geographers that certain pillars which are seen in the Danube in Gervia, near Belgrade, are remains of the bridge which Trajan constructed over the river, presumed that these pillars were petrified, and that they would furnish some information with regard to the time which nature employs in changing wood into stone. He therefore ordered his ambassador at the court of Constantinople to ask permission to take up from the Danube one of the pillars of Trajan's bridge. The petition was granted, and one of the pillars was accordingly taken up; from which it appeared that the petrifaction had only advanced three-fourths of an inch in the space of 1500 years. There are, however, certain waters in which this transmutation is more readily accomplished. Petrifactions appear to be formed more slowly in earths that are porous and in a slight degree moist, than in water itself. When the foundations of the city of Quebec in Canada were dug up, a petrified savage was found among the last beds to which they proceeded. There was no idea of the time at which this man had been buried under the ruins, but his quiver and arrows were still well preserved. In digging a lead mine in Derbyshire, in 1744, a human skeleton was found among stags' horns. It is impossible to say how many ages this carcase had lain there. In 1695 the entire skeleton of an elephant was dug up near Tonne in Thuringia. Some time before this epoch the petrified skeleton of a crocodile was found in the mines of that country. We might cite another fact equally curious, which happened at the beginning of the last century. John Munte, curate of Slægarp in Scania, and several of his parishioners, wishing to procure turf from a drained marshy soil, found, some feet below ground, an entire cart, with the skeletons of the horses and carter. It is presumed that there had formerly been a lake in that place, and the carter, attempting to pass over on the ice, had by that means probably perished. In fine, wood, partly fossil and partly coally, has been found at a great depth, in the clay of which tile was made for the abbey of Fontenay. Fossil wood was also discovered in the middle of the last century, at the depth of seventy-five feet in a well betwixt Issi and Vauvres near Paris. This wood was in sand betwixt a bed of clay and pyrites, and water was found four feet lower than the pyrites. M. de Laumont, inspector-general of the mines, says (Journal de Physique, Mai 1736) that in the lead mine at Pontpean near Rennes, is a fissure, perhaps the only one of its kind. In this fissure sea-shells, rounded pebbles, and an entire beech, have been found 240 feet deep. This beech was laid horizontally in the direction of the fissure. Its bark was converted into pyrites, the sap-wood into jet, and the centre into coal. Many pieces of petrified wood are found in different departments of France, and particularly in that of Mont Blanc, the ci-devant Savoy. In Cobourg in Saxony, and in the mountains of Misnia, trees of a considerable thickness have been taken from the earth, which were entirely changed into a very fine agate, as also their branches and their roots. In sawing them the annual circles of their growth have been distinguished. Pieces have been taken up, on which it was distinctly seen that they had been gnawed by worms; others bear visible marks of the hatchet. In fine, pieces have been found which were petrified at one end, while the other still remained in the state of wood fit for being burned. It appears then that petrified wood is a great deal less rare in nature than is commonly imagined.

Mr. Sinclair of Ulbster, M. P., lately transmitted to professor Jameson, for the Edinburgh College Museum, a collection of *petrified fishes*, found by him in the old red sandstone formation in the neighbourhood of Thurso; and the minister of South Ronaldshay, one of the Orkneys, lately deposited in the College Museum specimens of the same description, collected by himself in the old red sandstone of that island. These fishes are also found in a variety of sandstone flag now extensively imported into Edinburgh from Caithness.

Cronstedt has excluded petrifactions from any place in the body of his system of mineralogy, but takes notice of them in his appendix. He distinguishes them by the name of mineralia larvata, and defines them to be 'mineral bodies in the form of animals or vegetables.' The most remarkable observations concerning them, according to Kirwan, who differs in some particulars from Mongez, are as follow:—1. Those of shells are found on or near the surface of the earth; those of fish deeper; and those of wood deeper still. Shells in substance are found in vast quantities, and at considerable depths. 2. The substances most susceptible of petrifaction are those which most resist the putrefactive process; of which kind are shells, the harder kinds of wood, &c.; while the softer parts of animals, which easily putrefy, are seldom met with in a petrified state. 3. They are most commonly found in strata of marl, chalk, lime-stone, or clay; seldom in sandstone; still more seldom in gypsum; and never in gneiss, granite, basaltes, or schoerl. Sometimes they are found in pyrites, and ores of iron, copper, and silver; consisting almost always of that kind of earth or other mineral which surrounds them; sometimes of silex, agate, or cornelian. 4. They are found in climates where the animals themselves could not have existed. 5. Those found in slate or clay are compressed and flattened

The different species of petrifactions, according to Cronstedt, are, I. Terræ larvatæ; extraneous bodies changed into a limy substance, or calcareous changes. These are, 1. Loose or friable; 2. Indurated. The former are of a chalky nature, in form of vegetables or animals; the second filled with solid limestone in the same forms. Some are found entirely changed into a calcareous spar. All of them are found in France, Sweden, and other countries in great plenty. On these petrifactions Cronstedt observes, that shells and corals are composed of limy matter even when still inhabited by their animals, but they are classed among the petrifactions as soon as the calcareous particles have obtained a new arrangement; for example, when they have become sparry; filled with calcareous earth either hardened or loose, or when they lie in the strata of the earth. 'These,' says he, 'form the greatest part of the fossil collections which are so industriously made, often without any regard to the principal and only use they can be of, viz. that of enriching zoology. Mineralogists are satisfied with seeing the possibility of the changes the limestone undergoes in regard to its particles; and also with receiving some insight into the alteration which the earth has been subject to, from the state of the strata which are now found in it.' The calcined shells, where the petrifactions are of a limy or chalky nature, answer extremely well as a manure; but the indurated kind serve only for making grottoes. Gypseous petrifactions are extremely rare: however, Chardin informs us, that he had seen a lizard enclosed in a stone of that kind in Persia. II. Larvæ, or bodies changed into a flinty substance. These are all indurated, and are of the following species: 1. Cornelians in form of shells from the river Tomm in Siberia. 2. Agate in form of wood: a piece of which is said to be in the collection of the count de Tessin. 3. Coralloids of white flint (millepora) found in Sweden. 4. Wood of yellow flint found in Italy, in Turkey near Adrianople, and produced by the waters of Lough-neagh in Ireland. III. Larvæ argillaceæ; where the bodies appear to be changed into clay. These are found either loose and friable, or indurated. Of the former kind is a piece of porcelain clay, met with in a certain collection, with all the marks of the root of a tree upon it. Of the latter kind is the osteocolla; which is said to be roots of the poplar tree changed, and not to consist of any calcareous substance. A sort of fossile ivory, with all the properties of clay, is said likewise to be found in some places. IV. Larvæ insalitæ; where the substances are impregnated with great quantities of salts. Human bodies have been twice found impregnated with vitriol of iron in the mine of Fahlun, in the province of Dalarne in Sweden. One of them was kept for several years in a glass case, but at last began to moulder and fall to pieces. Turf and roots of trees are likewise found in water strongly impregnated with vitriol. They do not flame, but look like a coal in a strong fire; neither do they decay in the air. V. Bodies penetrated by mineral inflammable substances. 1. By pit-coal, such as wood; whence some have imagined coal to have been originally produced from wood. Some of these substances are fully saturated with the coally matter; others not. Among the former Cronstedt reckons jet; among the latter the substance called mumia vegetabilis, which is of a loose texture, resembling amber, and may be used as such. 2. Those penetrated by asphaltum or rock-oil. The only example of these given by our author is a kind of turf in the province of Skone in Sweden. The Egyptian mummies, he observes, cannot have any place among this species, as they are impregnated artificially with asphaltum, in a manner similar to what happens naturally with the wood and coally matter in the last species. 3. Those impregnated with sulphur which has dissolved iron, or with pyrites. Human bodies, bivalve and univalve shells, and insects, have been all found in this state; and the last are found in the alum state at Andrarum, in the province of Skone in Sweden. VI. Larvæ metalliferæ; where the bodies are impregnated with metals. These are, 1. Covered with native silver; which is found on the surface of shells in England. 2. Where the metal is mineralised with copper and sulphur. Of this kind is the Fahletz, or gray silver ore, in the shape of ears of corn, and supposed to be vegetables, found in argillaceous slate at Frankenberg and Tahlitteren in Hesse. 3. Larvæ cupriferæ, where the bodies are impregnated with copper. To this species principally belong the turquoise or Turkey stones, improperly so called; being ivory and bones of the elephant or other animals impregnated with copper. See TURQUOISE. At Simore, in the ci-devant Languedoc, there are bones of animals dug up, which, during calcination, assume a blue color; but, according to Cronstedt, it is not probable that these owe their color to copper. 3. With mineralised copper. Of these our author gives two examples. One is where the copper is mineralised with sulphur and iron, forming a yellow marcasitical ore. With this some shells are impregnated which lie upon a bed of loadstone in Norway

Other petrifactions of this kind are found in the form of fish in different parts of Germany. The other kind is where the copper is impregnated with sulphur and silver. Of this kind is the gray silver ore, like ears of corn, found in the slate quarries at Hesse. 4. Larvæ ferriferæ, with iron in form of a calx, which has assumed the place or shape of extraneous bodies. These are either loose or indurated. Of the loose kind are some roots of trees found at the lake Algelma in Finland. The indurated kinds are exemplified in some wood found at Orbissan in Bohemia. 5. Where the iron is mineralised, as in the pyritaceous larvæ. VII. Where the bodies are tending to decomposition, or in a way of destruction. Among these, our author enumerates mould and turf.

There has been lately published at Leipzic, a work in folio, with numerous plates, entitled Geognostical Flora of a former world, by Graf Kasper von Sternberg. The drawings appear to be faithfully executed, and many of the objects represented are of the same description with those so abundantly distributed in our coal-fields. The well-known geologist baron Von Schlotheim is also about (1828) an extensive work on petrifactions, and, judging from the accuracy and extensive knowledge of the author, it cannot fail to prove a valuable addition to this interesting branch of natural history. Emmerling, the mineralogist, has also announced a work on the fossil organic remains met with in brown coal, and other new formations of the same description. See our article REMAINS, ORGANIC.

PETRIFYING WATERS. The river of Ayr, in Ayrshire, has been long said to possess a strong petrifying power; and the water of Ayr stones, which are nothing but wood petrified in that river, are universally known, as substances for making hones for razors. There are also several springs of this kind in Roxburgh-shire. 'One is found,' says the Rev. J. Arkle, 'on the Tweeden, exceedingly powerful, and containing a great quantity of water, where large masses of petrified matter appear on every side converted into solid stone. The progress of the petrifaction is distinct and beautiful. The fog, which grows on the edge of the spring, and is sprinkled with water, is about eight inches high; the lower part is converted into solid stone; the middle appears as if half frozen, and the top is green and flourishing. The petrified matter, when burnt, is resolved into very fine lime. The spring itself, when led over the fields in little rills, fertilises them exceedingly.'—*Sir. J. Sinclair's Statistical Accounts*, Vol. XVI.

PETRINAL, PETRONEL, or POITRINAL, a species of fire-arm between the arquebuse and the pistol, which was used among the French during the reign of Francis I. There is mention made of it in an account of the siege of Rouën, which was undertaken by Henry IV. in 1592. It was shorter than the musket, but of a heavier calibre, and not unlike our blunderbuss; being slung in a cross-belt so as to rest upon the chest of the person who discharged it. From this circumstance it obtained the name of Poitrinal.

PETROBRUSSIANS, a religious sect, which had its rise in France and the Netherlands about A. D. 1110. The name is derived from Peter Bruys, a Provençal, who attempted to reform the abuses of the church. His followers were numerous: and for twenty years he labored in the ministry with great zeal. He was, however, burnt in 1130, by an enraged populace set on by the clergy. The chief of Bruys's followers was a monk named Henry; from whom the Petrobrussians were also called Henricians. They held, 1. That children before the age of reason cannot be justified by baptism. 2. That no churches should be built, but that those that already are should be pulled down. 3. That the cross ought to be pulled down and burnt, because we ought to abhor the instrument of our Saviour's passion. 4. That the real body and blood of Christ are not exhibited in the eucharist, but merely represented by their figures and symbols. 5. That sacrifices, alms, prayers, &c. do not avail the dead.

PETROCORII, the ancient inhabitants of that part of Gaul which was called Perigord before the revolution. Cæs. de Bell. Gall. vii. c.

PETROJOANNITES, followers of Peter John, or Peter Joannes, i. e. Peter the son of John, who flourished in the twelfth century. His doctrine was not known till after his death, when his body was taken out of his grave and burnt. His chief opinions were, that he alone had the knowledge of the true sense wherein the apostles preached the gospel; that the reasonable soul is not the form of man, and that there is no grace infused by baptism.

PETROL, or } Fr. *petrole*. Liquid;
PETRO'LEUM, *n.s.* } bitumen.

Petrol or *petroleum* is a liquid bitumen, black, floating on the water of springs. *Woodward.*

PETROLEUM, or rock oil, a thick oily substance exuding out of the earth, and collected on the surface of wells in many parts of the world. See CHEMISTRY, Index. It is found in various wells of Italy, in many parts of the Modenese, France, Switzerland, Germany, and Scotland, as well as in Asia. It is also found mixed with earth and sand, whence it may be separated by infusion in water. It is of a pungent and acrid taste, and smells like the oil of amber, but more agreeable. It is very light and pellucid; but, though equally bright and clear under all circumstances, it is liable to a very great variety in its color. Naturally it is almost colorless, and greatly resembles the purest oil of turpentine; this is called white petroleum, though it is as colorless as water. It is sometimes tinged of brownish, reddish, yellowish, or faint greenish color; but its most frequent color is a mixture of reddish and blackish, in such a degree that it looks black when viewed behind the light, but purple when placed between the eye and the light. It is rendered thinner by distillation with water, and leaves a resinous residuum; when distilled with a volatile alkali, the latter acquires the properties of succinated ammoniac, and contains the acid of amber. It is the most frequent of all the liquid bitumens, and is perhaps the most valuable of them all in medicine. It is to be chosen the purest, lightest, and most pellucid that can be had; of the most penetrating smell and most inflammable. Monet says that some kinds of it are of the density of nut oil. It is insoluble in spirit of wine; which, though it be the great dissolvent of sulphur, has no effect upon petroleum, not even with ever so long a digestion. It will not take fire with the dephlegmatic acid spirits; and in distillation, either by balneum mariæ or in sand, it will neither yield phlegm nor acid spirit; but the oil itself rises in its own form, leaving in the retort only a little matter, thick as honey, and of a brownish color. The finer kinds resemble naphtha. Mr. Bouldoc made several experiments with the white petroleum of Modena; an account of which he gave to the Paris academy. It easily took fire on being brought near a candle, and that without immediately touching the flame; and when heated in any vessel it will attract the flame of a candle, though placed at a great height above the vessel; and, the vapor it sends up taking fire, the flame will be communicated to the vessel of heated liquor, and the whole will be consumed. Alonso Barba gives a melancholy instance of the power of petroleum of taking fire at a distance. A certain well yielding petroleum on the surface of its water being to be repaired, the workman took down into the well with him a lantern and a candle in it; there were some holes in the lantern, through which the petroleum at a considerable distance sucked out the flame of the candle, and, taking fire, burst up with the noise of a cannon, and tore the man to pieces. It burns in the water; and when mixed with any liquor swims on the surface of it, even of the highest rectified spirit of wine, which is one-seventh heavier than pure petroleum. It readily mixes with all the essential oils of vegetables, as oil of lavender, turpentine, &c., and seems very much of their nature. The distinguishing characteristic of the petroleum is its thickness, resembling inspissated oil; when pure it is lighter than spirit of wine; but, though ever so well rectified, it becomes in time thick and black as before. Petroleum, when shaken, yields a few bubbles; but they sooner subside than in almost any other liquor, and the liquor resumes its clear state again almost immediately. This seems owing to the air in this fluid being very equally distributed to all its parts, and the liquor being composed of particles very evenly and nicely arranged. The extensibility of the oil is also amazing. A drop of it will spread over several feet of water, and in this condition it gives a great variety of colors; that is, the several parts of which this thin film is composed act as so many prisms. The most severe frost never congeals petroleum into ice; and paper wetted with it becomes transparent as when wetted with oil; but it does not continue so, the paper becoming opaque again in a few minutes as the oil dries away. There are three varieties according to Mongez: 1. The yellow, found at Modena in Italy; very light and volatile. 2. The reddish, or yellowish red; some of which is collected at Gabian in Languedoc and in Alsace. 3. The heavy black or brown kind, which is the most common, and met with in England, France, Germany, and some other countries. It generally runs out either from chinks or gaps of rocks, or is mixed with the earth, and gushes out of it; or swims on the water of some fountains. According to Dr. Lippert, a kind of resin is produced by mixing petroleum with smoking nitrous acid. The taste of this substance is very bitter, but the smell resembles that of musk. The vitriolic acid, according to Lippert, produces a resin still more bitter, but without any aromatic smell. Cronstedt enumerates the following species:—

I. Petroleum Barbadense, Malcha or Barbadoes tar, a thick substance resembling soft pitch. It is found in several parts of Europe and Asia; particularly Sweden, Germany, and Switzerland; on the coast of the Dead Sea in Palestine; in Persia, in the chinks of rocks, and in strata of gypsum and limestone, or floating upon water. It is found also in America, and at Colebrook-dale in England. It melts easily and burns with much smoke and soot, leaving either ashes or a slag according to the heterogeneous matter it contains. It contains a portion of the acid of amber. It gives a bitter salt with mineral alkali, more difficult of solution than common salt, and which, when treated with charcoal, does not yield any sulphur.

II. Petroleum Elasticum, elastic bitumen, or mineral caoutchouc.

III. Petroleum Induratum, hardened rock-oil, or fossile pitch, an inflammable substance dug out of the ground in many parts of the world, and known by the names of petroleum induratum, pix montana, indenpech, berghartz, &c. There are two species: 1. The asphaltum or pure fossile pitch, found on the shores of the Dead Sea, and of the Red Sea; also in Sweden, Germany, and France. See Asphaltum. It is likewise found in great quantities in a bituminous lake in the isle of Trinidad. See Trinidad. It is a smooth, hard, brittle, inodorous substance, of a black or brown color when looked at; but, on holding it up betwixt the eye and the light, appears of a deep red. It swims in water; breaks with a smooth and shining surface; melts easily, and when pure burns without leaving any ashes; but if impure, leaves ashes, or a slag. M. Monnet asserts that it contains sulphur, or at least the vitriolic acid. It is slightly and partially acted upon by spirits of wine and ether. Brunnich says, the asphaltum comes from Porto Principe in the island of Cuba in the West Indies. It is likewise found, according to Fourcroy, in many parts of China; and is used for a covering to ships by Arabs and Indians. 2. The pix montana impura contains a great quantity of earthy matter, which is left in the retort after distillation, or upon the charcoal if burnt in the open fire. It coheres like a slag, and is of the color of black lead; but, in a strong heat, this earth is soon volatilised, so that its nature is not yet well known. During the distillation a liquid substance falls into the receiver, which is found to be of the same nature with rock-oil. The substance itself is found in Sweden and several other countries. The pissasphaltum is of a mean consistence, between the asphaltum and the common petroleum. Mongez says that it is the same with the bitumen collected from a well named De la Pege, near Clermont Ferrand in France. The people of Mount Claro, in Italy, several years ago, discovered an easier way of finding petroleum than that to which they formerly had been used. This mountain abounds with a sort of grayish salt, which lies in large horizontal beds, mingled with strata of clay, and large quantities of a spar of that kind called by the Germans selenites; which is the common sort, that ferments with acids, and readily dissolves in them, and calcines in a small fire. They pierce these slates in a perpendicular direction till they find water; and the petroleum which had been dispersed among the cracks of those slates is then washed out by the water, and brought from all the neighbouring places to the hole or well which they have dug, on the surface of the water of which it swims after eight or ten days. When there is enough of it got together, they lade it from the top of the water with brass basins; and it is then easily separated from what little water is taken up with it. These wells or holes continue to furnish the oil in different quantities for a considerable time; and, when they will yield no more, they pierce the slates in some other place. It is never used among us as a medicine; but the French give it internally in hysteric complaints, and to their children for worms; some also give it from ten to fifteen drops in wine for suppressions of the menses. This, however, is rather the practice of the common people than of the faculty.

PETROMYZON, the lamprey, in ichthyology, a genus of fishes belonging to the class of amphibia nantes. It has seven spiracula at the side of the neck, no gills, a fistula on the top of the head, and no breast or belly fins. There are three species, distinguished by peculiarities in their back fins.

1. P. bronchialis, or lampern, is sometimes found of the length of eight inches, and about the thickness of a swan's quill; but they are generally much smaller. The body is marked with numbers of transverse lines, that pass cross the sides from the back to the bottom of the belly, which is divided from the mouth to the anus by a straight line. The back fin is not angular, but of an equal breadth. The tail is lanceolated, and short at the end. They are frequent in the rivers near Oxford, particularly the Isis; but not peculiar to that county, being found in other English rivers, where, instead of concealing themselves under the stones, they lodge in the mud, and are never observed to adhere to any thing like other lampreys.

2. P. fluviatilis, the river or lesser lamprey, sometimes grows to the length of ten inches. The mouth is formed like that of the preceding. On the upper part is a large bifurcated tooth: on each side are three rows of very minute ones: on the lower part are seven teeth, the exterior of which on one side is the largest. The irides are yellow. As in all the other species, between the eyes on the top of the head is a small orifice, of great use to clear its mouth of the water that remains on adhering to the stones; for through that orifice it ejects the water in the same manner as cetaceous fish. On the lower part of the back is a narrow fin; beneath that rises another, which at the beginning is high and angular, then grows narrow, surrounds the tail, and ends near the anus. The color of the back is brown or dusky, sometimes mixed with blue; the white underside silvery. These are found in the Thames, Severn, and Dee; are potted with the larger kind; and are by some preferred to it, as being milder tasted. Vast quantities are taken about Mortlake, and sold to the Dutch for bait for their cod fishery. Above 430,000 have been sold in a season at 40s. per 1000; and, of late, about 100,000 have been sent to Harwich for the same purpose. It is said that the Dutch have the secret of preserving them till the turbot fisher..

3. P. marinus, the sea lamprey, is sometimes found so large as to weigh four or five pounds. It greatly resembles the eel in shape; but its body is larger, and its snout longer, narrower, and sharper, at the termination. The opening of the throat is very wide; each jaw is furnished with a single row of very small teeth; in the middle of the palate are situated one or two other teeth, which are longer, stronger, and moveable towards the inside of the throat; the inferior part of the palate presents moreover a row of very small teeth, which reaches to the bottom of the throat, where are four long notched bones; two short fistulous processes are observable at the extremity of the snout, and there are two others thicker, but still shorter, above the eyes. Willoughby supposes that the latter are the organ of hearing, and the former the organ of smell. His opinion with regard to the auditory faculty of this fish is founded on what we read in ancient authors, that the fishermen attracted the lampreys by whistling, and that Crassus had tamed one of them to such a degree that it knew his voice and obeyed his call. The eyes of the lamprey are small, and covered with a transparent light blue membrane; the pupil is bordered with a circle of a color resembling gold; near the gills, which are four, there is a round hole on both sides, through which it discharges the water. The lamprey has no fins on his belly or breast; on the back we observe a fin, which begins pretty near the head, extends to the tail which it turns round, and is afterwards continued to the anus; this fin is covered by the skin of the body, to which it adheres but loosely; the skin is smooth, of a red blackish color, and streaked with yellow, the lamprey advances in the water with winding motions, like those of a serpent, which is common to it, with all the anguilliform fishes. The lamprey lives on fish. During the cold it lies concealed in the crevices of sea rocks, and consequently is fished for only at certain seasons. It lives in a state of hostility with the poulpe, a kind of sea polypus, which shuns the combat as long as it can; but, when it finds the impossibility of escape, it endeavours to surround the lamprey with its long arms. The latter slips away, and the poulpe becomes its prey. The lobster, we are told, avenges the poulpe, and destroys the lamprey in its turn. See CANCER. Rondelet says that the fishermen consider the bite of the lamprey as venomous and dangerous, and never touch it while alive but with pincers. They beat it on the jaws with a stick, and cut off its

head. He adds, that its ashes are a cure for its bite, and for the king's evil. When any one has been bitten by a lamprey, the most effectual method is to cut out the part affected. Lampreys are very dexterous in saving themselves; when taken with a hook, they cut the line with their teeth; and, when they perceive themselves caught in a net, they attempt to pass through the meshes. They fish for lampreys only on the pebbly edges of sea rocks; some of these pebbles are drawn together to make a pit as far as the water's edge, or a little blood is thrown in, and the lamprey immediately puts forth its head between two rocks. As soon as the hook, which is baited with a crab or some other fish, is presented to it, it swallows greedily, and drags it into its hole. There is then occasion for great dexterity to pull it out suddenly; for if it is allowed time to attach itself by the tail, the jaw would be torn away before the fish could be taken. This shows that its strength resides in the end of its tail; for the great bone of this fish is reversed, so that the bones, which in all other fishes are bent towards the tail, are here turned in a contrary direction, and ascend towards the head. After the lamprey is taken out of the water, it is not killed without a great deal of trouble; the best way is to cut the end of its tail, or to crush it with repeated blows on the spine, to prevent it from leaping; as its animal life extends to the end of the spinal marrow. M. De Querhoent denies the supposed poison of the lamprey. This species, he says, abounds on the coasts of Africa, at the Antilles, on the coast of Brasil, at Surinam, and in the East Indies. When taken with a hook, the fisher must kill it before he takes it off, otherwise it darts upon him, and wounds him severely. Its wounds, however, are not venomous, M. de Querhoent having seen several sailors who were bitten by it, but experienced no disagreeable consequences. Lampreys are likewise found in great abundance at Ascension Island, but particularly in the seas of Italy: their flesh when dried is excellent; and boiling gives to the vertebræ the color of gridelin. The flesh of the lamprey is white, fat, soft, and tender; it is pretty agreeable to the taste, and almost as nourishing as that of the eel; those of a large size are greatly superior to the small ones. Mr. Pennant is of opinion that the ancients were unacquainted with this fish.

PETRONEL, *n. s.* Fr. *petrinal.* A pistol; a small gun used by a horseman.

> And he with *petronel* upheaved,
> Instead of shield the blow received,
> The gun recoiled as well it might.
>
> *Hudibras.*

PETRONEL. See PISTOL.

PETRONIUS, a renowned Roman senator. When governor of Egypt, he permitted Herod, king of the Jews, to purchase in Alexandria a large quantity of corn for the supply of his subjects, who were afflicted with a severe famine. When Tiberius died, Caius Caligula, who succeeded him, took from Vitellius the government of Syria, and gave it to Petronius, who discharged the duties of his office with dignity and honor. From his favoring the Jews, he ran the risk of losing the emperor's friendship and his own life; for when that prince gave orders to have his statue deposited in the temple of Jerusalem, Petronius, finding that the Jews would rather suffer death than see that sacred place profaned, was unwilling to have recourse to violent measures; and therefore preferred moderation to cruel measures to enforce obedience. In his voyage to Africa, of which country he had been appointed quæstor, the ship in which he sailed was taken by Scipio, who caused all the soldiers to be put to the sword, and promised to save the quæstor's life, provided he would renounce Cæsar's party. Petronius replied that 'Cæsar's officers were accustomed to grant life to others, and not to receive it;' and, at the same time, he stabbed himself with his own sword.

PETRONIUS ARBITER (Titus), a great critic and polite writer, the favorite of Nero, supposed to be the same mentioned by Tacitus in his Annals, lib. xvi. He was proconsul of Bithynia, and afterwards consul, and appeared capable of the greatest employments. He was one of Nero's principal confidants, and the superintendant of his pleasures. The great favor shown him drew upon him the envy of Tigellinus, another of Nero's favorites, who accused him of being concerned in a conspiracy against the emperor: on which Petronius was seized, and was sentenced to die. He met death with a striking indifference, and seems to have tasted it nearly as he had done his pleasures. He would sometimes open a vein, and sometimes close it, conversing with his friends in the meanwhile, not on the immortality of the soul, which was no part of his creed, but on topics which pleased his fancy, as of love-verses, agreeable and passionate airs. Of this disciple of Epicurus, Tacitus gives the following character:—'He was,' says he, 'neither a spendthrift nor a debauchee; but a refined voluptuary, who devoted the day to sleep, and the night to the duties of his office, and to pleasure.' He is much distinguished by a satire which he wrote, and secretly conveyed to Nero; in which he ingeniously describes, under borrowed names, the character of this prince. Peter Petit discovered at Traw in Dalmatia, in 1665, a considerable fragment containing the sequel of Petronius's Trimalcion's Feast. This fragment, which was printed in 1666 at Padua and Paris, produced a paper war among the learned. While some affirmed that it was the work of Petronius, and others denied it to be so, Petit sent it to Rome. The French critics, who had attacked its authenticity, were silent after it was deposited in the royal library. It is now generally attributed to Petronius. The public did not form the same favorable opinion of some other fragments, which were extracted from a MS. found at Belgrade in 1688, and printed at Paris by Nodot in 1694, though they are ascribed by the editor Charpentier, and other learned men, to Petronius. His genuine works are, 1. A Poem on the Civil War between Cæsar and Pompey, translated into prose by Marolles, and into French verse by Bouhier, 1737, in 4to. Petronius, disgusted with Lucan's flowery language, opposed a Pharsalia to his Pharsalia; but his work, though superior to Lucan's in some respects, is not in the true style of epic poetry. 2. A Poem on the Education of the Roman Youth. 3. Two Treatises upon the corruption of Eloquence, and the Decay of Arts and Sciences, 4. A Poem on Dreams. 5. The Shipwreck of Licas. 6. On the Inconstancy of Human Life. And, 7. Trimalcion's Banquet. This last performance is a description of the pleasures of a corrupted court; and the painter is rather an ingenious courtier than a person whose aim is to reform abuses. The best editions of Petronius are those published at Venice, 1499, in 4to.; at Amsterdam, 1669, in 8vo.; cum notis Var. Ibid. with Boschius's notes, 1677, in 24to.; and 1700, 2 vols. in 24mo. The edition variorum was reprinted in 1743, in 2 vols. 4mo., with Peter Burman s commentaries. Petronius died in 65 or 66.

PETRONIUS GRANIUS, a centurion in the eighth legion, who served with reputation under Cæsar in the Gallic war.

PETRONIUS MAXIMUS was born A. D. 395, of an illustrious family, being at first a senator and consul of Rome. He put on the imperial purple in 455, after having effected the assassination of Valentinian III. To establish himself upon the throne, he married Eudoxia, the widow of that prince; and, as she was ignorant of his villany, he confessed to her, in a transport of love, that the strong desire he had of being her husband had made him commit this atrocious crime. Whereupon Eudoxia privately applied to Genseric, king of the Vandals, who, coming into Italy with a very powerful army, entered Rome, where the usurper then was. Petronius endeavoured to escape; but the soldiers and people, enraged at his cowardice, fell upon him, and overwhelmed him with a shower of stones. His body was dragged through the streets for three days; and, after every other mark of disgrace, thrown into the Tiber, the 12th of June, 455. He reigned only seventy-seven days. Yet he had some good qualities. He loved and cultivated the sciences. He was prudent in council, circumspect in his actions, equitable in his judgments, a facetious companion, and steady friend. He had gained the affections of every body, while he remained in a private station.

PETROSA OSSA, in anatomy, a name given to the fourth and fifth bones of the cranium, called also ossa temporum and ossa squamosa; the substance whereof, as their first and last names express, is squamose and very hard.

PETROSELINUM (apium petroselinum, Lin.), parsley. See APIUM. This plant is commonly cultivated for culinary purposes. The seeds have an aromatic flavor, and are occasionally used as carminatives, &c. The root is one of the five aperient roots, and with this intention is sometimes made an ingredient in apozems and diet-drinks; if liberally used, it is apt to occasion flatulencies; and thus, by distending the viscera, produces a contrary effect to that intended by it; the taste of this root is somewhat sweetish, with a light degree of warmth and aromatic flavor.

PETROSILEX, in mineralogy, compact felsspar. See MINERALOGY.

PETSCHORA, a large river of European Russia, which rises in the Ural Mountains, flows to the northward through the governments of Perm and Archangel, and falls into the Arctic Ocean, near Pustoserskoe, after a course of above 600 miles. It receives the Lialsa, Ukscha, and Elima, and is navigable during summer. The steppes of Petschora form an immense plain, lying between the Dwina and Petschora, in which there is a number of lakes. The north part of the steppes is covered with nothing but moss and stunted shrubs; but in the south there are large forests. The surface on the east side is rocky. The inhabitants are wandering Samojedes.

PETTEIA, in the ancient music, a term to which we have no one corresponding in our language. The melopœia, or the art of arranging sounds in succession so as to make melody, is divided into three parts, which the Greeks call lepsis, mixis, and chresis; the Latins sumptio, mixtio, and usus; and the Italians presa, mescolamento, and uso. The last of these is called by the Greeks πεττεια, and by the Italians pettia; which therefore means the art of making a just discernment of all the manners of ranging or combining sounds among themselves, so that they may produce their effect, i. e. may express the several passions intended to be raised. Thus it shows what sounds are to be used, and what not; how often they are severally to be repeated; with which to begin, and with which to end; whether with a grave sound to rise, or an acute one to fall, &c. The petteia constitutes the manner of the music; chooses out this or that passion, this or that motion of the soul, to be awakened; and determines whether it be proper to excite it on this or that occasion. The petteia, therefore, is in music much what the manners are in poetry It is not easy to discover whence the denomination should have been taken by the Greeks, unless from πεττεια, their game of chess; the musical petteia being a sort of combination and arrangement of sounds, as chess is of pieces called πεττοι calculi, or chess-men.

PETTICOAT, *n. s.* Fr. *petit* and *coat.* The lower part of a woman's dress.

What trade art thou, Feeble?—A woman's taylor, Sir.—Wilt thou make as many holes in an enemy's battle, as thou hast done in a woman's *petticoat*? *Shakspeare.*

Her feet beneath her *petticoat*,
Like little mice, stole in and out,
As if they fear'd the light. *Suckling.*

It is a great compliment to the sex, that the virtues are generally shewn in *petticoats*. *Addison.*

To fifty chosen sylphs, of special note,
We trust the important charge, the *petticoat*;
Oft have we known that sevenfold fence to fail,
Though stiff with hoops, and armed with ribs of whale. *Pope.*

As we were in the midst of the service a lady who is the chief woman of the place, and had passed the winter at London with her husband, entered the congregation in a little head-dress, and a hooped *petticoat*. *Spectator.*

PETTIFOGGER, *n. s.* From Fr. *pettivoguer*; *petit* and *voguer*. A petty lawyer; a 'trouble-town,' says Minsheu, 'having neither law nor conscience.'

The worst conditioned and least cliented *pettifoggers* get, under the sweet bait of revenge, more plentiful prosecution of actions.
Carew's Survey of Cornwall.

Your *pettifoggers* damn their souls
To share with knaves in cheating fools.
Hudibras.

Consider, my dear, how indecent it is to abandon your shop and follow *pettifoggers*: there is hardly a plea between two country esquires about a barren acre, but you draw yourself in as bail, surety, or solicitor. *Arbuthnot's John Bull.*

Physicians are apt to despise empyrics; lawyers, *pettifoggers*; and merchants, pedlars. *Swift.*

PETTITOES, *n. s.* Petty and toe. The feet of a sucking pig: human feet, in contempt.

My good clown grew so in love with the wenches' song, that he would not stir his *pettitoes*, till he had both tune and words. *Shakspeare. Winter's Tale.*

PETTO, *n. s.* Ital. and Belg. The breast; figuratively, privacy. Thus we say, 'en petto.'

PETTY, *adj.* } Fr. *petit.* Small; in-
PETTINESS, *n. s.* } ferior; inconsiderable; paltry: pettiness is littleness of matter or character; meanness.

The losses we have borne, the subjects we
Have lost, and the disgrace we have digested;
To answer which his *pettiness* would bow under.
Shakspeare.

When he had no power,
But was a *petty* servant to the state,
He was your enemy. *Id. Coriolanus.*

It is a common experience, that dogs know the dog-killer; when, as in time of infection, some *petty* fellow is sent out to kill the dogs. *Bacon.*

It importeth not much, some *petty* alteration or difference it may make. *Id.*

From thence a thousand lesser poets sprung,
Like *petty* princes from the fall of Rome. *Denham.*

Will God incense his ire
For such a *petty* trespass? *Id.*

Common reason directed even Pagan wise men wholly to interdict swearing in ordinary conversation, or about *petty* matters, as an irrational and immoral practice, unworthy of sober and discreet persons. *Barrow.*

They believe one only chief and great God, which hath been from all eternity; who, when he proposed to make the world, made first other gods of a principal order; and after, the sun, moon, and stars, as *petty* gods. *Stillingfleet.*

Bolonia watered by the *petty* Rhine.
Addison.

By all I have read of *petty* commonwealths, as well as the great ones, it seems to me that a free people do of themselves divide into three powers.
Swift.

Can an example be given, in the whole course of this war, where we have treated the *pettiest* prince, with whom we have had to deal, in so contemptuous a manner? *Id.*

PETTY (Sir William), son of Anthony Petty, a clothier, was born at Romsey, a small market town in Hampshire, in 1623. It is difficult to determine, whether the course of his education was directed more by his father or himself; for being taken when a child to view the common mechanics at work, he soon, by the bent of genius and inclination, took up the tools, and learned to handle them with such dexterity, that at twelve he had attained a skill in various trades, not much inferior to that of the ordinary workman. At fifteen he was master of the Latin, Greek, and French tongues, and of arithmetic and those parts of geometry and astronomy useful to navigation. Soon after he went to Caen and Paris, where he studied anatomy with Mr. Hobbes. Upon his return to England, he was preferred in the king's navy. In 1643, when the war occurred between the king and parliament, he went into the Netherlands and France for three years; and having prosecuted his studies in physic at Utrecht, Leyden, Amsterdam, and Paris, he retured home to Rumsey. In 1647 he obtained a patent to teach the art of double writing for seventeen years. In 1648 he published at London, Advice to Mr. Samuel Hartlib, for the advancement of some particular parts of learning. At this time he adhered to the prevailing party of the kingdom: and went to Oxford, where he taught anatomy and chemistry, and was created M. D. In 1650 he was made professor of anatomy there; and soon after a member of the college of physicians in London, and physician to the army in Ireland; where he continued till 1659, and acquired a great fortune. After the Restoration he was introduced to king Charles II., who knighted him in 1661. In 1662 he published A Treatise of Taxes and Contributions. In 1663 he invented a double-bottomed ship. He died at London of a gangrene in the foot, occasioned by a swelling of the gout, in 1687. The character of his genius is sufficiently seen in his writings, which are very numerous. Amongst these he wrote the History of his own Life. He died possessed of a fortune of about £15,000 a-year.

PETTY (William), marquis of Lansdown, was descended from the above Sir William Petty, and born in 1737. He succeeded to the Irish title of earl of Shelburne, on the death of his father in 1761; and in 1763 was president of the board of trade, an office which he resigned to join the train of opposition led by Mr. Pitt (lord Chatham), with whom he returned to office in 1766. When a change of ministry took place, in 1768, he became an antagonist of ministers till 1782, when he was nominated secretary of state for the foreign department. On the death of the marquis of Rockingham he was succeeded by lord Shelburne; but he was soon obliged to give way to the coalition between lord North and Mr. Fox. In 1784 his lordship became an English peer, by the titles of marquis of Lansdown and earl of Wycombe; and employed himself in the cultivation of science and literature at Bow Wood, his seat in Wiltshire. He collected a valuable library, the MSS. belonging to which were, after his death, purchased by the British Museum. His death took place in 1805.

PETTY BAG, an office in chancery, the three clerks of which record the return of all inquisitions out of every county, and make all patents of comptrollers, gaugers, customers, &c.

PETTY LARCENY. See LARCENY.

PETTY SINGLES, among falconers, the toes of a hawk.

PETTY TALLY, in the sea language, a competent allowance of victuals, according to the number of the ship's company.

PETTY TREASON. See TREASON.

PETTY WHIN, a species of ononis.

PET'ULANCE, *n. s.* } Fr. *petulance*; Lat.
PET'ULANCY, } *petulantia.* Peevish-
PET'ULANT, *adj.* } ness; pertness; wan-
PET'ULANTLY, *adv.* } tonness: petulant and
petulantly follow these senses.

It was excellently said of that philosopher that there was a wall or parapet of teeth set in our mouth, to restrain the *petulancy* of our words. *Ben Jonson.*

Such was others *petulancy*, that they joyed to see their betters shamefully outraged and abused. *King Charles.*

Wise men knew, that which looked like pride in some, and like *petulance* in others, would, by experience in affairs and conversation amongst men, be in time wrought off. *Clarendon.*

The tongue of a man is so *petulant*, and his thoughts so variable, that one should not lay too great stress upon any present speeches and opinions. *Spectator.*

However their numbers, as well as their insolence and perverseness increased, many instances of *petulancy* and scurrility are to be seen in their pamphlets. *Swift.*

There appears in our age a pride and *petulancy* in youth, zealous to cast off the sentiments of their fathers and teachers. *Watts.*

If the opponent sees victory to incline to his side, let him shew the force of his argument, without too importunate and *petulant* demands of an answer. *Id.*

To be humane, generous and candid, is a very high degree of merit in any case; but those qualifications deserve still greater praise, when they are found in that condition which makes almost every other man, for whatever reason, contemptuous, insolent, *petulant*, selfish, and brutal. *Johnson.*

PETUNSE, in natural history, one of the substances whereof porcelain or china-ware is made. The petunse is a coarse kind of flint or pebble, the surface of which is not so smooth when broken as that of our common flint. See PORCELAIN. According to Chaptal, the petunse is that species of silex known by the names of feldspar, rhomboidal quartz, and spathum scintillans. It very frequently forms one of the principles of granite, and the crystals which are found separate arise from the decomposition of this primitive rock. The texture of feldspar is close, lamellated, and it is less hard than quartz. It fuses, without addition, into a whitish glass. The specific gravity of white feldspar is 25·946: 100 parts of white feldspar contain about 67 silex, 14 alumine, 11 barytes, and 8 magnesia.

PETWORTH, a market-town and parish in Sussex, near the river Arun, twelve miles from Arundel, and fifty south-west from London. In this place is the magnificent seat of the earl of Egremont. The streets of the town are irregular, but the houses are well built. In the centre is a market-house, in one of the rooms over which the quarter sessions are held. Here are also a charity-school, alms-house, hospital, and a bridewell, on Howard's plan. The church is a neat building, and has several monuments of the Percy family. Market on Saturday. Fairs, Holy-Thursday, and November 20th.

PEUCEDANUM, or sulphur-wort, a genus of the digynia order, belonging to the pentandria class of plants; and in the natural method ranking under the forty-fifth order, umbellatæ. The fruit is lobated, striated on both sides, and surrounded by a membrane; the involucra are very short. There are three species, none of which have any remarkable properties, excepting the P. officinale, or common hog's fennel, growing naturally in the English salt marshes, and rising to the height of two feet, with channelled stalks, which divide into two or three branches, each crowned with an umbel of yellow flowers, composed of several small circular umbels. The roots, when bruised, have a strong fœtid scent like sulphur, and an acrid, bitterish, unctuous taste. Wounded in the spring, they yield a considerable quantity of yellow juice, which dries into a gummy resin, and retains the strong smell of the root. The expressed juice was used by the ancients in lethargic disorders.

PEUCER (Gaspar), professor of medicine at Wirtemberg, was born at Bautzen in Lusatia. He married a daughter of Melancthon, whose works he published in 1601, in 5 vols. Being a Protestant, and being closely imprisoned for ten years for his opinions, he wrote his thoughts on the margins of old books, with ink made of burnt crusts soaked in wine. He died in 1602.

PEUCESTES, a brave general under Alexander the Great, who bestowed on him a crown of gold. See MACEDON.

PEVENSEY, a town of Sussex, on a river which runs into a bay in the English Channel, and forms Pevensey Harbour. It has an ancient castle, originally belonging to Robert earl of Moreton, brother to William the Conqueror, and thought a fine specimen of Roman architecture. Sueno the Dane landed at it in 1049, carried off his cousin Beorn, and murdered him. It was afterwards ravaged by earl Godwin and his son Harold, who carried off many ships. The church is also an ancient structure. The castle belongs at present to the Cavendish family. Here William the Conqueror landed previous to the battle of Hastings. It is fourteen miles W. S. W. of Hastings, and sixty-three south of London.

PEUTEMAN (Peter), a Dutch painter, born at Rotterdam in 1650. His subjects were either allegorical or emblematical allusions to the shortness and misery of human life. He died in consequence of a fright in 1692.

PEUTINGER (Conrad), a learned German, born at Augsburg in 1465. He became secretary to the senate of Augsburg; and published an ancient itinerary, called Tabula Peutingeriana, marking the roads by which the Roman armies passed to the greater part of the empire. He died in 1574.

PEW, *n. s.* Belg. *puy*; Ital. *poggio.* A seat enclosed in a church.

When Sir Thomas More was lord chancellor, he did use at mass, to sit in the chancel, and his lady in a *pew.* *Bacon.*

How I foresee in many ages past,
When Lolioe's caytive name is quite defaced,
Thine heyre, thine heyre's heyre, and his heire again,
From out the loynes of careful Lolian,
Shall climbe up to the chancell *pewes* on hie,
And rule and raigne in their rich tenancie.
Hall's Satires.

Should our sex take it into their heads to wear trunk breeches at church, a man and his wife would fill a whole *pew*. *Addison.*

She decently, in form, pays heaven its due;
And makes a civil visit to her *pew*. *Young.*

Pews, in a church, are somewhat in the nature of an heir-loom; and may descend by immemorial custom, without any ecclesiastical concurrence, from the ancestor to the heir. The right to sit in a particular pew in the church arises either from prescription as appurtenant to a messuage; or from a faculty or grant from the ordinary; for he has the disposition of all pews which are not claimed by prescription. Gibs. Cod. 221. In an action for a disturbance of the enjoyment of a pew, if the plaintiff claims it by prescription, he must state it in the declaration as appurtenant to a messuage in the parish; and then such prescription may be supported by an enjoyment for thirty-six years; and perhaps for any time above twenty years. 1 Term. Rep. 428. So uninterrupted possession of a pew in the church for thirty years, unexplained, is presumptive evidence of a prescriptive right to the pew in an action against a wrong-doer: but may be rebutted by proof that prior to that time the pew had no existence. 5 Term. Rep. K. B. 297.

PE'WET, *n. s.* Teut. *piewit*; Belg. *kiewit*. A water fowl.

We reckon the dip-chick, so named of his diving and littleness, puffins, *pewets*, meawes. *Carew.*

PEW'TER, *n. s.* } PEW'TERER. } Fr. *epeutre*; Ital. and Span. *peltre*. An artificial metal, principally made of tin; the pewter vessels of a house: a worker of pewter.

He shall charge you and discharge you with the motion of a *pewterer's* hammer. *Shakspeare.*

Coarse *pewter* is made of fine tin and lead. *Bacon.*

The *pewter*, into which no water could enter, became more white, and liker to silver, and less flexible. *Id.*

Pewter dishes, with water in them, will not melt easily, but without it they will; nay, butter or oil, in themselves inflammable, yet, by their moisture, will hinder melting. *Id.*

We caused a skilful *pewterer* to close the vessel in our presence with soder exquisitely. *Boyle.*

The eye of the mistress was wont to make her *pewter* shine. *Addison.*

Nine parts or more of tin, with one of regulus of antimony compose *pewter*. *Pemberton.*

Pewter, in French called *étain*, and often confounded thus with pure tin, is a factitious metal used in making domestic utensils, as plates, dishes, &c. The basis is tin, which is converted into pewter by mixing at the rate of 1 cwt. of tin with fifteen pounds of lead and six pounds of brass. Besides this composition, which makes the common pewter, there are other kinds, compounded of tin, antimony, bismuth, and copper, in several proportions.

'Blocks of tin are often melted by the pewterers into small rods. I found that a cubic foot of the specimen I examined,' says Dr. Watson, 'weighed 7246 ounces: but even this sort exceeds in purity any of the kinds examined by some authors. Chemistry affords certain methods of discovering the quantity of lead with which tin is alloyed; but these methods are often troublesome in the application. Pewterers, and other dealers in tin, use not so accurate a method of judging of its purity, but one founded on the same principle; for the specific gravities of bodies being nothing but the weights of equal bulks of them, they cast a bullet of pure tin, and another of the mixture of tin and lead, which they want to examine, in the same mould; and the more the bullet of the mixture exceeds the bullet of pure tin in weight, the more lead they conclude it contains.

'Pewter is a mixed metal; it consists of tin united to small portions of other metallic substances, such as lead, zinc, bismuth, and the metallic part, commonly called regulus of antimony. We have three sorts of pewter in common use; they are distinguished by the names of plate, trifle, ley. The plate pewter is used for plates and dishes; the trifle chiefly for pints and quarts; and the ley-metal for wine measures, &c. Our very best sort of pewter is said to consist of 100 parts of tin and of seventeen of regulus of antimony, though others allow only ten parts of regulus to 100 of tin; to this composition the French add a little copper. Crude antimony, which consists of nearly equal portions of sulphur and of a metallic substance, may be taken inwardly with great safety; but the metallic part, or regulus, when separated from the sulphur, is held to be very poisonous. Yet plate-pewter may be a very innocent metal; the tin may lessen or annihilate the noxious qualities of the metallic part of the antimony. We have an instance somewhat similar to this in standard silver, the use of which has never been esteemed unwholesome notwithstanding it contains nearly one-twelfth of its weight of copper. Though standard silver has always been considered as a safe metal, when used for culinary purposes, yet it is not altogether so; the copper it contains is liable to be corroded by saline substances into verdigris. This is frequently seen, when common salt is suffered to stay a few days in silver saltsellers, which have not a gold gilding; and even saline draughts, made with volatile salt and juice of lemons, have been observed to corrode a silver tea-spoon which had been left a week in the mixture.'

The weight of a cubic foot of each of these sorts of pewter is:

Plate	7248
Trifle	7359
Ley	7963

If the plate-pewter be composed of tin and regulus of antimony there is no reason to expect that a cubic foot of it should be heavier than it appears to be; since regulus of antimony, according to the different ways in which it is made, is heavier or lighter than pure tin. A very fine silver-looking metal is said to be composed of 100 pounds of tin, eight of regulus of antimony, one of bismuth, and four of copper. The ley pewter, if we may judge of its composition by comparing its weight with the weights of the mixtures of tin and lead mentioned in the table, contains not so much as a third, but more than a fifth, part of its weight of lead: this quantity of lead is far too much, considering one of the uses to which this sort of pewter is applied; for acid wines will readily corrode the lead of the flagons in which they are measured into sugar of lead; this danger is not so great with us, where wine is seldom sold by the measure, as it is in other countries where it is generally sold so; and their wine measures contain, probably, more lead than ours do. Our English pewterers have at all times made a mystery of their art; and their caution was formerly so much encouraged by the legislature that an act of parliament was passed, rendering it unlawful for any master-pewterer to take an apprentice, or to employ a journeyman, who was a foreigner. In the present improved state of chemistry this caution is useless; since any one tolerably skilled in that science would be able to discover the quality and quantity of the metallic substances used in any particular sort of pewter; and it is not only useless now, but one would have thought it must have been always so; whilst tin, the principal ingredient, is found in England in the purest state, as well as largest quantity.

Pewter has occasionally served for money. In the Philosophical Transactions, M. Putland states that king James II. turned all the pewter vessels, &c., of the Protestants in Ireland he could seize, into money; half-crowns were somewhat bigger than halfpence, and other pieces in proportion. He ordered it to be current in all payments: whence, our author observes, people absconded for fear of being paid their debts: he also mentions crown pieces of this metal, with this legend on the rim, 'melioris tessera fati.'

PEYER (J. Conrad), a learned German physician, born at Schaffhausen. He published Exercitatio Anatomica Medica de Glandulis Intestinorum, at Schaffhausen, in 1677.

PEYRERE (Isaac la), was born at Bourdeaux, of Protestant parents. He entered into the service of the prince of Condé, who was much pleased with the singularity of his genius. From the perusal of St. Paul's writings he took into his head to aver that Adam was not the first of the human race; and to prove this extravagant opinion, he published in 1655 a book, printed in Holland in 4to. and in 12mo., with this title, Præadamitæ, sive exercitatio super versibus 12, 13, 14, cap. 15, Epistolæ Pauli ad Romanos. This was burnt at Paris, and the author imprisoned at Brussels. The prince of Condé having obtained his liberty, he travelled to Rome in 1656, and there gave in to pope Alexander VII. a solemn renunciation both of Calvinism and Preadamism. His conversion was not thought to be sincere, at least with regard to this last heresy. His desire to be the head of a new sect is evident; and in his book he pays many compliments to the Jews, and invites them to attend his lectures. Upon his return to Paris he went again into the prince of Condé's service as his librarian. Some time after he retired to the seminary des Vertus, where he died January 30th, 1676, aged eighty-two. He left behind him, 1. A treatise, as singular as it is scarce, entitled Du rappel des Juifs, 1643, in 8vo. The recal of the Israelites, in the opinion of this writer, will be not only of a spiritual nature, but they will be reinstated in the temporal blessings which they enjoyed before their rejection. They will again take possession of the Holy Land, which will resume its former fertility; and their restorer will be a king of France. 2. A curious and entertaining account of Greenland, 8vo. 1647; 3. An equally interesting account of Iceland, 1663, 8vo.; 4. A letter to Philotimus, 1658, in 8vo. in which he explains the reasons of his recantation, &c.

PEYRONIUS (Francis de la), an eminent French surgeon, who practised at Paris with such eclat that he was appointed first surgeon to Louis XV. He improved this favorable situation, and procured to his profession those establishments which contributed to extend its benefits. The Royal College of Surgery at Paris was founded by his means in 1731, was enlightened by his knowledge, and encouraged by his munificence. At his death, which happened at Versailles, 24th of April 1747, he bequeathed to the society of surgeons in Paris two-thirds of his effects, his estate of Marigni, which was sold to the king for 200,000 livres, and his library. He also left to the society of surgeons at Montpelier two houses, with 100,000 livres, to erect there a chirurgical amphitheatre. He was a philosopher without ostentation; his understanding was acute, his natural vivacity rendered his conversation agreeable; and he possessed an uncommon degree of sympathy for those in distress.

PEYROUSE. See PEROUSE.

PEYTAHN, a mountainous irregular district and town in Northern Hindostan, tributary to the Ghoorkhali rajah of Nepaul; situated about 29° of N. lat. It is covered with jungle, and intersected by numerous streams from the hills. The cultivated valleys are very productive, but they are not many. The town stands in lat. 29° 4′ N., long. 82° 15′ E.

PEZAY (N. Masson), marquis of, a native of Paris, was a captain of dragoons; and gave some lessons on tactics to Louis XVI. He died in the beginning of 1778. He left behind him, 1. A Translation of Catullus; 2. Les Soirées Helvetiennes, Alsaciennes, et Franc Comtoises, in 8vo. 1770; 3. Les Soirées Provençales, in MS.; 4. La Rosiere de Salency, a pastoral, in three acts, which has been performed with success on the Italian theatres; 5. Les Campagnes de Maillebois, in 3 vols. 4to., and a volume of maps.

PEZENAS (Esprit), a learned Jesuit, born at Avignon in 1692. He became professor of medicine at Marseilles. His works and translations are numerous, and esteemed for their perspicuity.

PEZENAS, or PESENAS, Piscenna, an ancient town of the department of Herault, France, the chief place of a canton in the arrondissement of Beziers. It is a post-town, with 8300 inhabitants, having a board of trade, an exchange, and a communal college. It is pleasantly situated at the confluence of the Peine and the Herault, in a rich and fertile valley, where cultivated fields, orchards, gardens, and verdant shrubberies meet you on every side. From the platform of its ancient castle there is a most delightful prospect over the little river Peine, which flows under the walls, and, crossing some smiling meadows, falls into the Herault. Pezenas is renowned for the salubrity of its air; the surrounding country, formerly laid waste by subterraneous fires, presents, in an extent of more than eighteen miles diameter, craters and large masses of basaltic rock.

The manufactures of handkerchiefs, linens, muslins, flannels, woollen and cotton counterpanes; hats, soap, wet and dry verdigris; chemicals, and grape sugar, are carried on here; there are likewise cotton and silk spinning-mills; brandy distilleries; wool-washing houses, &c. The trade consists in wheat, rye, oats, yellow grain, red tartar, dyers' weed, olive oil, preserved olives, dry raisins, and figs, capers, fruit, silk, wool, &c. Every Saturday there is a considerable market for wines, brandy, and other spirits. There is a beautiful assembly-room in the town, and charming walks in the neighbourhood, overlooked by rising grounds covered with almond-trees, olives, and vines. Pezenas is eighteen miles north-east of Beziers, and thirty-three south-west of Montpelier.

PEZIZA, cup mushroom, in botany, a genus of the natural order of fungi, belonging to the cryptogamia class of plants. The fungus campanulated and sessile. Linnæus enumerates eight species.

PEZRON (Paul), a very learned and ingenious Frenchman, born at Hennebon in Brittany in 1639, and admitted into the order of Citeaux in 1660. He was a great antiquary, and was author of The Antiquity of Time restored and defended against the Jews and Modern Chronologers. He went through several promotions, the last of which was to the abbey of Charmoye, and died in 1706.

PFEFFEL (Christian Frederick), a modern diplomatist, was born at Colmar in 1726. He studied first under Schœfflin, whom he assisted in his Alsatia Illustrata; and became secretary to the count de Loss, ambassador from Saxony to France. He was then the friend of the count de Bruhl, and employed in several negociations. In 1758 he was sent to Ratisbon, during the diet, as counsellor of state and chargé-d'affaires: thence he proceeded to the court of Bavaria, where he remained until 1768, when he was recalled to Versailles, and became juris-consult to the king. He also obtained, in conjunction with his son, the charge of stett-mestre of Colmar; and was sent by the French ministry to Deux Ponts, to treat of the indemnities of the duke, and other German princes: he was still there when he received the order for his retirement from his public functions; his property was confiscated, and he was placed on the list of emigrants. He died in 1807. His principal works are, Abregé Chronologique de l'Histoire, et du Droit publique d'Allemagne; Recherches Historiques concernant les Droits du Pape sur la Ville et l'Etat d'Avignon, avec des Pièces justificatives; Etat de la Pologne; Dissertations Historiques.

PFEFFERCORN (John), a learned Jew, who was converted to Christianity. He was the author of De Abolendis Judæorum scriptis; and, consistently with the title of that work, endeavoured to persuade the emperor Maximilian to burn all the Hebrew books, except the Bible. He wrote some other tracts also in Latin.

PFIFFER, or PFEIFFER (Augustus), a learned German, born at Lawenburg. He was eight years superintendant of the churches in Lubec, and became professor of oriental languages at Leipsic; where he died in 1698.

PFIFFER (Lewis), a brave Swiss general, in the service of France under Charles IX. With 8000 men, drawn up in a hollow square, he preserved the life of that monarch, in the famous retreat of Meaux, against all the efforts of the prince of Conde. But his chief merit lay in his mechanical and topographical exertions. He made a model of Switzerland, the most extraordinary thing of the kind ever executed. He was elected advoyer, or chief magistrate of Lucerne, and died in that city and office in 1594.

PFINS AND ENZ, a circle of the grand duchy of Baden, lying along the two rivers Pfinz and Enz, from the Rhine to the frontier of Wirtemberg. It includes the north part of the old margraviate, with part of the bishopric of Spire and the Creichgau. Population about 132,000. It is divided into two jurisdictions, including ten bailiwics. The chief town is Bruchsal.

PFORTZHEIM, a town of the west of Germany, in Baden, at the junction of the Wurm and Nagold. It is surrounded with a wall and ditch, and consists of the Town, Old Town, the Aue, and the suburb of Brozingen. The inhabitants manufacture linen, trinkets, and hardware articles. They carry on also a brisk traffic in wood, from the neigbouring forest of Hagenschiess, sent to Holland by the Rhine. Population 5400. Seventeen miles E. S. E. of Carlshrue, and twenty-two W. N. W. of Stutgard.

PHÆA, a famous sow which infested the neighbourhood of Cromyon. Theseus destroyed it as he was travelling from Trœzene to Athens to make himself known to his father. Some imagine that the boar of Calydon sprang from this sow. According to some authors Phæa was a woman who prostituted herself to strangers, whom she murdered, and afterwards plundered.

PHÆACES, the PHÆAGIANS, the people of Phæacia. They first inhabited Hyperia. See HYPERIA. They were noted for their indolence and luxury: hence Horace uses Phæax for a person indolent and sleek; and hence arose their indolence and pride.—*Aristotle*.

PHÆACIA, one of the names of the island Corcyra. See CORCYRA. This island was famous for producing large quantities of the finest flavored apples. Ovid, Juvenal, Propertius. Alcinous was king of it, who rendered his name famous by his gardens and his hospitality to Ulysses. It is now called Corfu. See ALCINOUS, CORCYRA, and CORFU.

PHÆCASIA, one of the Sporades Isles.

PHÆDON, a disciple of Socrates, who had been seized by pirates in his youth; and the philosopher, who seemed to discover something uncommon and promising in his countenance, bought his liberty for a sum of money, and ever after esteemed him. Phædon, after Socrates's death, returned to Elis his native country, where he founded a sect of philosophers, who composed what was called the Eliac school. The name of Phædon is affixed to one of Plato's dialogues.

PHÆDRA, in fabulous history, a daughter of

Minos and Pasiphae; she married Theseus, by whom she was the mother of Acamas and Demophoon. They had lived for some time in conjugal felicity when Venus, who hated all the descendants of Apollo, because he had discovered her amours with Mars, inspired Phædra with the strongest passion for Hippolytus, the son of Theseus, by the amazon Hippolyte. This passion she long attempted to stifle, but in vain; and therefore, in the absence of Theseus, she addressed Hippolytus with all the impatience of desponding love. He rejected her with horror and disdain. She, to punish his coldness and refusal, at the return of Theseus, accused Hippolytus of attempts upon her virtue. He, without hearing Hippolytus's defence, banished him from his kingdom, and implored Neptune, who had promised to grant three of his requests, to punish him in an exemplary manner. As Hippolytus fled from Athens, his horses were suddenly terrified by a sea monster, which Neptune had sent on the shore; and he was thus dragged through precipices and over rocks, trampled under the feet of his horses, and crushed under the wheels of his chariot. When his tragical end was known at Athens, Phædra confessed her crime, and hung herself in despair. She was buried at Trœzene, where her tomb was still to be seen in the age of Pausanias, near the temple of Venus, which she had built to render the goddess propitious.

PHÆDRIA, a small town of Arcadia.—*Paus.*

PHÆDRUS, an ancient Latin writer, who composed five books of fables, in Iambic verse. He was a Thracian; and his being called Augustus's freedman, in the title of the book, shows that he had been that emperor's slave. The fables of Phædrus remained buried in libraries, altogether unknown to the public, until the close of the sixteenth century.

PHÆDRUS (Thomas), a professor of eloquence at Rome, early in the sixteenth century. He was canon of Lateran, and keeper of the library in the Vatican. He owed his rise to the acting of Seneca's Hippolytus, in which he performed the part of Phædra; whence he got the name of Phædrus. He died under the age of fifty. Janus Parrhasius gives a list of several of his works which were almost ready for public view.

PHÆDYMA, the daughter of Otanes, one of the seven Persian conspirators, who, being married to the false Smerdis, discovered his imposture to her father, by his want of ears, which had been cut off by Cambyses. See PERSIA.

PHÆNARETE, the mother of Socrates the philosopher. She was a midwife by profession.

PHÆNIAS, a peripatetic philosopher, a disciple of Aristotle. He wrote a History of Tyrants.—Diog. Laert.

PHÆNNA, one of the Graces.—Paus. ix. 35.

PHÆNOMENON, *n. s.* See PHENOMENON. This has phænomena in the plural; Gr. φαινομενον. An appearance in the works of nature; a remarkable appearance.

The paper was black, and the colors intense and thick, that the *phænomenon* might be conspicuous.
Newton.

PHÆNOMENON, in philosophy, denotes any remarkable appearance, whether in the heavens or earth, and whether discovered by observation or experiment.

PHAER (Thomas,) M. D., an English physician, born in Pembrokeshire. He graduated at Oxford in 1539. He published several tracts on diseases and their remedies; and was also celebrated as a poet. He translated nine books and part of the tenth into English verse; and died in 1560.

PHÆSANA, an ancient town of Arcadia.

PHÆSTUM, in ancient geography: 1. A town of Crete; 2. A town of Macedonia.—Liv. 36, c. 13.

PHAETON, in fabulous history, the son of Phœbus and Clymene, one of the Oceanides. Venus became enamoured of him, and, entrusted him with the care of one of her temples. This rendered him vain and aspiring; and, having obtained from his father the direction of the chariot of the sun for one day, he was unable to guide the fiery steeds; and, loosing the reins, Jupiter, to prevent his consuming the heavens and earth struck him with a thunderbolt, and hurled him from his seat into the river Eridanus or Po. His sisters Phaetusa, Lampetia, and Phœbe, lamenting his loss upon its banks, were changed by the gods into black poplar trees, and their tears into amber; and Cycnus, king of Liguria, also grieving at his fate, was transformed into a swan. The poets say that, while Phaeton was driving the chariot of his father, the blood of the Ethiopians was dried up; and their skin became black. The territories of Libya were also parched up; and ever since Africa, unable to recover her original verdure and fruitfulness, has exhibited a sandy desert. Some explain this poetical fable thus:—Phaeton was a Ligurian prince, who studied astronomy, and in whose age the neighbourhood of the Po was visited with uncommon heats.

PHAETON, in ornithology, a genus of birds belonging to the order of anseres; the characters of which are:—The bill is sharp, straight, and pointed; the nostrils are oblong, and the hinder toe is turned forward. There are two species, viz.—

1. P. æthereus, the tropic bird, is about the size of a partridge, and has very long wings. The bill is red, with an angle under the lower mandible. The eyes are encompassed with black, which ends in a point towards the back of the head. Three or four of the larger quill-feathers, towards their ends, are black, tipped with white; all the rest of the bird is white, except the back, which is variegated with curved lines of black. The legs and feet are of a vermilion-red. The toes are webbed. The tail consists of two long straight narrow feathers, almost of equal breadth from their quills to their points. 'The name tropic bird,' says Latham, 'given to this genus, arises from its being chiefly found within the tropic circles; but we are not to conclude that they never stray voluntarily, or are driven beyond them; for we have met with instances to prove the contrary.' There are several varieties:—1. One called by Latham the white tropic bird. It is less than the preceding, and is found in as many places. The plumage is in general a silvery white. 2. The yellow tropic

bird is another variety, the plumage being a yellowish white. These differences, Mr. Latham thinks, arise merely from age, if they are not the distinguishing mark of sex. 3. The black-billed tropic bird is smaller than any of the former. The bill is black; the plumage on the upper part of the body and wings is striated, partly black and partly white: before the eye there is a large crescent of black; behind it is a streak of the same; the forehead and all the under parts of the body are of a pure white color; the quills and tail are marked as the upper parts, but the ends of the first are white, and most of the feathers of the last are marked with dusky black at the tips; the sides over the thighs are striated with black and white; the legs are black. 4. The red-tailed tropic bird is in length about two feet ten inches, of which the two tail feathers alone measure one foot nine inches. The bill is red; the plumage white, tinged with an elegant pale rose-color; the crescent over the eyes is somewhat abrupt in the middle; the ends of the scapulars are marked with black. This variety is distinguished by two middle long tailed feathers, which are of a beautiful deep red color, except the shafts and base, which are black: the sides over the thighs are dusky; and the legs are black.

2. P. demersus, the red footed penguin, has a thick, arched, red bill; the head, back part of the neck, and the back, of a dusky purplish hue, and breast and belly white; brown wings, with the tips of the feathers white; instead of a tail, a few black bristles; and red legs. It is found on Penguin Isle, near the Cape of Good Hope, is common all over the South Seas, and is about the size of a goose.

PHAETONTIADES, the sisters of Phaeton. See PHAETON.

PHAETUSA. See PHAETON.

PHÆUS, a town of Peloponnesus.

PHAGEDE'NA, *n. s.* } Fr. *phagedenique*;
PHAGEDEN'IC, *adj.* } Gr. φαγεδαινα; from
PHAGEDE'NOUS. } φαγω, to eat. A virulent ulcer: phagedenic and phagedenous mean corrosive; eating into the flesh.

A bubo, according to its malignancy, either proves easily curable, or terminates in a *phagedenous* ulcer with jagged lips. *Wiseman.*

When they are very putrid and corrosive, which circumstances give them the name of foul *phagedenick* ulcers, some spirits of wine should be added to the fomentation. *Sharp.*

Phagedenick medicines are those which eat away fungous or proud flesh. *Dict.*

PHAGEDENIC MEDICINES are those used to eat off proud or fungous flesh; such as are all the caustics.

PHAGEDENIC WATER, in chemistry, denotes a water made from quicklime and sublimate, efficacious in the cure of phagedenic ulcers.

PHAGESIA, an ancient festival among the Greeks; observed during the celebration of the Dionysia; so called from the φαγειν, good eating, that then universally prevailed.

PHALACRINE, an ancient village of the Sabines, where Vespasian was born.—Seut.

PHALÆNA, in entomology, the moth, a genus of insects of the order lepidoptera, having the antennæ gradually tapering from the base to the tips; tongue spiral; jaws none; wings, when at rest, generally deflected.

The caterpillars of this genus vary much as to size, and considerably as to their shape and number of feet. It is remarkable that caterpillars of almost every species of this genus are found with ten, twelve, fourteen, and sixteen feet. The last are the most common. See ENTOMOLOGY.

Moths fly abroad only in the evening, and during the night, and obtain their food from the nectar of flowers. The larva is active and quick in motion, mostly smooth, more or less cylindrical, and it preys voraciously on the leaves of plants. The pupa is torpid or quiescent, more or less cylindrical, pointed at the tip or at both ends; and is generally enclosed in a follicle. The following are the principal divisions of this tribe, according to the Linnæan system. Of the species there are upwards of 1500:—

1. *Bombyx.* Antennæ filiform; two feelers, which are compressed and reflected; tongue short, membranaceous, obtuse, and bifid; the larva is sixteen-footed, often hairy; the pupa is pointed at the tip.

Subdivisions {
a. Wings expanded.
b. —— reversed.
c. —— deflected.
d. —— incumbent
e. —— convolute.

Dr. Shaw and others have divided the section bombyx into two sections, viz. attaci, and bombyces properly so called.

2. *Geometra.* Antennæ filiform; feelers cylindrical; tongue projected, membranaceous, setaceous, bifid; the larva is from eight to ten-footed, six of which are pectoral, two caudal, and sometimes two sub-caudal; the pupa is pointed at the tip.

Subdivisions. {
a. Antennæ pectinate.
b. —— setaceous.
c. Wings forked.

3. *Noctua.* Antennæ setaceous; feelers compressed, hairy; the tip cylindrical and naked; tongue projecting, horny, setaceous, bifid; larva sixteen-footed; pupa pointed at the tip.

Subdivisions. {
a. Wings expanded.
b. —— flat incumbent, thorax smooth.
c. —— ——, —— crested.
d. —— deflected, thorax smooth.
e. —— ——, —— crested.

4. *Hyblea.* Antennæ setaceous; feelers projecting, compressed, dilated in the middle; the lip is projecting and acute.

5. *Hepialus.* Antennæ moniliform; feelers two, reflected, hairy, between which is the rudiment of a bifid tongue; the larva is sixteen-footed, feeding on the roots of plants; the pupa is folliculate, cylindrical, and pointed at the tip.

6. *Cossus.* Antennæ short, filiform; two feelers, very short, cylindrical, reflected.

7. *Pyralis.* Antennæ filiform; the insects of this division have likewise two feelers, which are equal and almost naked; they are cylindrical at the base, the middle is dilated into an oval, and subulate at the tip; the tongue is projected, setaceous, and bifid; the wings are very obtuse, and slightly curved at the exterior margin; the

larva is sixteen-footed, and rolling up the leaves to which it attaches itself.

8. *Tinea*. Antennæ setaceous; four feelers, which are unequal; the larva is found in houses among linen and woollen cloths, and furniture, in which it eats holes, and to which it is very destructive.

9. *Alucita*. Antennæ setaceous; two feelers, that are divided as far as the middle; the inner division is very acute.

10. *Pterophorus*. Antennæ setaceous; two feelers, that are linear and naked; the tongue is excerted, membranaceous, and bifid; the wings are fan-shaped, divided down to the base, and generally subdivided as far as the middle; the larva is sixteen-footed, ovate, and hairy; the pupa is naked, and subulate at the tip.

To describe the species would be impossible; but we shall mention a few.

1. P. alucita pentadactyla. The eyes of this species are black; the body is of a pale yellow. The wings are snow white, and the insect keeps them stretched asunder when at rest. The superior are divided in two, or rather appear composed of two stumps of birds' feathers united at the base. The inferior ones are likewise divided into three threads or bristles, which are furnished on both sides with fine fringes. The caterpillar is of a green color, dotted with black, and charged with a few hairs. It feeds upon grass, changes to a chrysalis about September, and appears a moth in August, frequenting woods.

2. P. attaca pavonia minor. The wings of this insect, says Barbut, are brown, undulated, and variegated, having some gray in the middle, and a margin one line broad; in its color yellowish-gray. The under part has more of the gray cast, but the extremities of the wings before the margin have a broad band of brown. The four wings, both above and beneath, have each a large eye, which eyes are black, encompassed with a dun-colored circle, and above that with a semicircle of white, then another of red, and lastly the eye is terminated by a whole circle of black. Across the middle of the eye is drawn transversely a small whitish line. The caterpillar is green, has sixteen feet with rose color tubercula, charged with long hairs terminated by a small knob; besides which it has dun-color or reddish rings. It is found upon fruit-trees.

3. P. noctua elinguis humuli. In this species the wings of the male are of a snowy white; of the female yellowish, with streaks of a deeper hue; the shoulders, abdomen, &c., in both sexes are deep yellow. The antennæ are pectinated and shorter than the thorax. The caterpillar feeds upon the roots of burdock, hops, &c., changes into a chrysalis in May, appears in the winged state in June, frequenting low marshy grounds where hops grow.

4. P. noctua pronuba spirilinguis. The thorax, head, antennæ, feet, and upper wings, are of a brown color, more or less dark, sometimes so deep as to be nearly black, but often of a bluish cast. The upper wings are moreover somewhat clouded, and have two black spots on the middle, the other towards the outward angle of the lower part of the wing. The under ones are of a beautiful orange color, with a broad black band near the lower edge of the wing, of which it follows the direction. The caterpillar is smooth; to be found on several plants, but particularly upon the thlaspi and some other cruciferous plants. It keeps in concealment during the day, and only feeds by night. Its metamorphosis is performed under ground, and some varieties of color are observable amongst these caterpillars; some being green, others brown; which latter yield males, the former females.

5. P. pentadactyla. Body and wings snowy; upper pair bifid, lower ones three parted. The larva of this species is sixteen-footed, hairy, green, with black dots, and a white dorsal line; the pupa is hairy, green, dotted with black. It appears in August. Its larva feeds on nettles.

6. P. hexadactyla. Wings cleft, cinereous, spotted with brown; all of them are six-parted. This species is found on the lonicera xylosteum, or honey-suckle; it is a very elegant and beautiful insect, and often flies into the house in the evening; it makes its appearance in the month of September. It has been called by English collectors the twenty-plumed moth.

PHALÆSIA, a town of Arcadia. Paus. 8.

PHALANGIUM, in zoology, a genus of insects belonging to the order of aptera. They have eight feet, two eyes on the top of the head placed very near each other, and other two on the sides of the head: the feelers resemble legs, and the belly is round. There are nine species; we submit the following, viz.:—

P. opilis of Linnæus. Its body is roundish, of a dusky brown on the back, with a duskier spot of a rhomboidal figure near the middle of it. The belly is whitish; the legs are extremely long and slender. On the back part of the head there stands a little eminence, which has on it a kind of double crest, formed as it were of a number of minute spines; the eyes are small and black, and are two in number. It is commonly called the shepherd spider. This species of spider multiplies singularly. They are great spinners. In autumn the stubble is quite covered with the threads of these spiders, by means of which they travel with ease, and ensnare their prey. However, those threads are thought rather to be the produce of a species of tick called autumnal weaver. A small degree of attention discovers an amazing multitude of those ticks almost imperceptible, and that is their work. The threads, when united, appear of a beautiful white, wave about in the air, and are known in the country by the name of virgin's threads. Some naturalists think that the threads floating in the air serve the insect as sails to waft it through the air, and as a net to entrap insects on the wing; for remnants of prey, say they, are discoverable in them. As to those parcels in which nothing is seen, they are only essays rejected by those travelling insects. The analogy between the phalangium and the crab, and the facility with which it parts with its legs to save the rest of the body, has raised a presumption that its legs might grow again as do those of the crabs and lobsters.

PHALANGOSIS, in surgery, a tumor and relaxation of the eye-lids, often so great as to deform the eye, and considerably to impede vision. Sometimes the eye-lid when in this state subsides or sinks down, occasioned perhaps either by a palsy of the muscle which sustains and elevates the eye-lid, or else from a relaxation of the cutis above, from various causes. Sometimes an œdematous or aqueous tumor is formed on the eye-lids, so as almost entirely to exclude vision; but this last case should be distinguished from the other, and may be easily remedied by the use of internal and topical medicines, such as purges and diuretics given inwardly, and a compress dipped in warm spirit of wine and lime water. But in the paralytic or relaxed case, the use of cordial and nervous medicines must be proposed internally; and outwardly balsam of Peru and Hungary water are to be employed. If all these fail, the remaining method of cure is to extirpate a sufficient quantity of the relaxed cutis; and then, after healing up the wound, the remainder will be sufficiently shortened.

PHALANNA, a town of Thessaly. Liv. 42. c. 54.

PHALANTHUS, a Spartan, the son of Aracus, and leader of the Parthenii, who founded Tarentum, in Italy. He was shipwrecked on the coast, but was carried ashore by a dolphin.

PHALANTHUS, a town and mountain of Arcadia. Paus. viii. 35.

PHA'LANX, *n. s.* Fr. *phalange*; Lat. *phalanx*. A troop of closely embodied men.

Here Titus found an extreme difficult piece of work. For this *phalanx*, being a great square battle of armed pikes, was not to be resisted by the Roman targetiers, as long as the *phalanx* itself held together undissolved. *Raleigh.*

Far otherwise the inviolable saints,
In cubic *phalanx* firm, advanced entire,
Invulnerable, impenetrably armed. *Milton.*

The Grecian *phalanx*, moveless as a tower,
On all sides battered, yet resists his power. *Pope.*

A stately superstructure, that nor wind,
Nor wave, nor shock of falling years could move;
Majestic and indissolubly firm!
As ranks of veteran warriors in the field,
Each by himself alone and singly seen,
A tower of strength; in massy *phalanx* knit,
And in embattled squadron rushing on,
A sea of valour, dread, invincible. *Pollok.*

PHALANX, in Grecian antiquity, a square battalion of soldiers, with their shields joined, and pikes crossing each other, so that it was next to impossible to break it. The Macedonian phalanx is supposed to have had the advantage in valor and strength over the Roman legion. It consisted of 16,000 men, of whom 1000 marched abreast, and thus was sixteen men deep, each of whom carried a kind of pike twenty-three feet long. The soldiers stood so close that the pikes of the fifth rank reached their points beyond the front of the battle. The hindermost ranks leaned their pikes on the shoulders of those who went before them, and, locking them fast, pressed briskly against them when they made the charge; so that the first five ranks had the impetus of the whole phalanx, which was the reason why the shock was generally irresistible. But the word phalanx was also used for a party of twenty-eight, and several other numbers; and even sometimes for the whole body of foot. See LEGION.

PHALANX is applied by anatomists to the three rows of small bones which form the fingers.

PHALANX, in natural history, is a term which Dr. Woodward and some other writers of fossils have used to express an arrangement of the columns of that sort of fossil coralloid body found frequently in Wales, and called lithostrotion. In the great variety of specimens we find of this, some have the whole phalanx of columns cracked through, and others only a few of the external ones; but these cracks never remain empty, but are found filled up with a white spar, as the smaller cracks of stone usually are. This is not wonderful, as there is much spar in the composition of this fossil; and it is easily washed out of the general mass to fill up these cracks, and is then always found pure, and therefore of its natural color, white. The lithostration, or general congeries of these phalanges of columns, is commonly found immersed in a gray stone, and found on the tops of the rocky cliffs about Milford in Wales. It is usually erect, though somewhat inclining in some specimens, but never lies horizontal. It seems to have been all white at first, but to have been since gradually tinctured with the matter of the stone in which it lies. The single columns, which form each phalanx, are usually round or cylindric, though sometimes flatted and bent; some of them are also naturally of an angular figure; these, however, are not regular in the number of their angles, some consisting of three sides, some of five, and some of seven; some are hexangular also, but these are scarce. They are from five or six to sixteen inches in length; and the largest are nearly half an inch over, the least about a quarter of an inch; the greater number are very equal to one another in size; but, the sides of the columns being unequal, the same column measures of a different thickness when measured different ways; the phalanges or congeries of these are sometimes of a foot or more in diameter. The columns are often burst, as if they had been affected by external injuries; and it is evident that they were not formed before several other of the extraneous fossils; for there are found sometimes shells of sea fishes and entrochi immersed and bedded in the bodies of the columns. It appears plainly hence that when these bodies were washed out of the sea, and tossed about in the waters which then covered the tops of these cliffs, this elegant fossil, together with the stony bed in which it is contained, were so soft that those other bodies found entrance into their very substance, and they were formed as it were upon them. This fossil takes an elegant polish, and makes in that state a very beautiful appearance, being of the hardness of the common white marble, and carrying the elegant structure visible in the smallest lineaments.

PHALARICA, in ancient warfare, was a javelin or long dart, of a particular construction, used by the inhabitants of Saguntum, when they so valiantly stood the siege of it. It was very thick, and had a sharp piece of iron, four feet long attached to it. It was used either as a weapon of close attack and defence, or as a fire-arm; being, in the latter case, wrapped up in tow and pitch, and, when set fire to, cast out of the balista against the enemy's wooden towers and other machines, for the purpose of consuming them. They were sent with so much force that they pierced through armed bodies of men.

PHALARIS, a remarkable tyrant, born at Crete, where his ambitious designs occasioned his banishment; he took refuge in Agrigentum, a free city of Sicily, and there obtained the supreme power by stratagem. What has chiefly contributed to preserve his name is his cruelty; in one act of which, however, he acted with strict justice. Perillus, a brass founder at Athens, knowing his disposition, invented a new mode of torture. He made a brazen bull, hollow within, bigger than the life, with a door in the side to admit the victims; who being shut up in it, a fire was kindled under it, to roast them to death; and the throat was so contrived that their dying groans resembled the roaring of a bull. The artist brought it to the tyrant, in hopes of a great reward. Phalaris admired the invention, but ordered the inventor to be put into it, to make the first trial. The end of this detestable tyrant is differently related; but it is very generally believed, with Cicero, that he fell by the hands of the Agrigentines; and, as some suppose, at the instigation of Pythagoras. Ovid tells us that his tongue was cut out; and that he was then put into the brazen bull. He reigned, Eusebius says, twenty-eight years.

PHALARIS, Canary grass, in botany, a genus of the trigynia order, belonging to the triandria class of plants: CAL. bivalved, carinated, and equal in length, containing the corolla. There are ten species, of which the most remarkable are,

1. P. arundinacea, the reed Canary grass; and
2. P. Canariensis, the manured Canary grass.

These are both natives of Britain. The first grows by the road sides; and is frequently cultivated for the sake of the seeds, which are found to be the best food for the Canary and other small birds. The second grows on the banks of rivers. It is used for thatching ricks or cottages, and endures much longer than straw. In Scandinavia they mow it twice a-year, and their cattle eat it. There is a variety of this cultivated in our gardens with beautifully striped leaves. The stripes are generally green and white; but sometimes they have a purplish cast. This is commonly called painted lady grass, or ladies' tresses.

PHALARIUM, a citadel of Syracuse, where Phalaris's bull was kept.

PHALARUS, a river of Bœotia, running into the Cephisus.

PHALERÆ, among the ancient Romans, were military rewards bestowed for some signal act of bravery. Authors do not agree whether the Phaleræ were a suit of rich trappings for a horse, or golden chains something like the torques, but so formed as to hang down to the breast and display a greater profusion of ornament. The last opinion prevails, but perhaps both are true.

PHALEREUS, a village and port of Athens; this last is neither large nor commodious, for which reason Themistocles put the Athenians on building the Piræus; both joined to Athens by long walls (Nepos). The Phalareus lay near the city (Pausanias). Demetrius Phalereus was of this place. See DEMETRIUS.

PHALERIA, a town of Thessaly.

PHALERON, PHALERUM, names given to the Phalereus Portus of Athens. See PHALEREUS.

PHALEUCIAN VERSE, in ancient poetry, a kind of verse consisting of five feet; the first of which is a spondee, the second a dactyl, and the last three trochees.

PHALEUCUS, a Roman poet, who invented the phaleucian verse.

PHALLICA, festivals observed by the Egyptians in honor of Osiris, the name is derived from φαλλος, simulacrum ligneum membri virilis. See PHALLUS.

PHALLOPHORI, persons who carried the phallus at the end of a long pole, at the festival of the PHALLICA. See last article, and PHALLUS. They appeared among the Greeks, besmeared with the dregs of wine, covered with the skins of lambs and wearing a crown of ivy.

PHALLUS, the morel, in botany, a genus of the order of fungi, belonging to the cryptogamia class of plants. The fungus is reticulated above, and smooth below. There are two species.

1. P. esculentus, the esculent morel, is a native of Britain, growing in woods, groves, meadows, pastures, &c. The substance, when recent, is wax-like and friable; the color a whitish yellow, turning brownish in decay; the height of the whole fungus about four or five inches. The stalk is thick and clumsy, somewhat tuberous at the base, and hollow in the middle. The pileus is either round or conical; at a medium, about the size of an egg, often much larger; hollow within; its base united to the stalk; and its surface cellular, or latticed with irregular sinuses. The magnified seeds are oval. It is much esteemed at table both recent and dried, being commonly used as an ingredient to heighten the flavor of ragouts. We are informed by Gleditsch that morels are observed to grow in the woods of Germany in the greatest plenty in those places where charcoal has been made. Hence the good women who collect them to sell, receiving a hint how to encourage their growth, have been accustomed to make fires in certain places of the woods, with heath, broom, vaccinium, and other materials, in order to obtain a more plentiful crop. This strange method of cultivating morels being however sometimes attended with dreadful consequences, large woods having been set on fire and destroyed by it, the magistrate thought fit to interpose his authority, and the practice is now interdicted.

2. P. impudicus, stinking morel, or stinkhorn, is also a native of Britain, and found in woods and on banks. It arises from the earth under a veil or volva, shaped exactly like a hen's egg, and of the same color, having a long fibrous radicle at its base. This egg-like volva is composed of two coats or membranes, the space between which is full of a thick, viscid, transparent matter, which, when dry, glues the coats together,

and shines like varnish. In the next stage of growth, the volva suddenly bursts into several lacerated permanent segments, from the centre of which arises an erect, white, cellular hollow stalk, about five or six inches high, and one thick, of a wax-like friable substance, and most fetid cadaverous smell, conical at each end, the base inserted in a white, concave, membranaceous turbinated cup, and the summit capped with a hollow, conical pileus, an inch long, having a reticulated cellular surface; its base detached from the stalk, and its summit umbilicated, the umbilicus sometimes perforated, and sometimes closed. The under side of this pileus is covered with a clear, viscid, gelatinous matter, similar to that found between the membranes of the volva; and under this viscid matter, concealed in reticulated receptacles, are found the seeds, which when magnified appear spherical. As soon as the volva bursts, the plant begins to diffuse its intolerable odors, which are so powerful and widely expanded, that the fungus may be readily discovered by the scent only, before it appears to the sight. At this time the viscid matter between the coats of the volva grows turbid and fuscous; and, when the plant attains its full maturity, the clear viscid substance in the pileus becomes gradually discolored, putrid, and extremely fetid, and soon afterwards turns blackish, and, together with the seeds and internal part of the pileus itself, melts away. The fetid smell then begins to remit, the fungus fades, and continues for a short time sapless and coriaceous, and at last becomes the food of worms. The cadaverous scent of this fungus greatly allures the flies; which, lighting upon the pileus, are entrapped in the viscid matter, and perish. We are informed by Gleditsch, that the people in Thuringia call the unopened volvæ by the ridiculous name of ghosts and dæmon's eggs; and that they collect and dry them either in the smoke or open air, and, when reduced to powder, use them in a glass of spirits as an aphrodisiac.

PHALLUS, among the Egyptians, was the emblem of fecundity. It was very fervently worshipped by women, especially by those who were barren. This custom was introduced among the Greeks, and festivals in honor of it were called phallica, or phaluca. See MYSTERIES. Among the Hindoos a similar emblem called lingam is used, and for similar purposes. See HINDOOS.

PHALOS, a term sometimes applied to an ornament placed at the head of the casque of ancient warriors. The Greek λοφος, and the Latin words crista and juba, have each been applied to ornaments of this description.

PHANÆUS, a promontory of Chios, famous for its wines. Liv. xxxvi. c. 43.

PHANAR, a suburb of Constantinople, north-east of the city, towards the sea. Here reside a number of respectable Greek families, the Greek patriarch, &c.

PHANES, a native of Halicarnassus, who was commander of the Grecian auxiliaries, sent to assist Amasis king of Egypt, whom he deserted. See EGYPT.

PHANETA, a town of Epirus. Liv. xxxii. c. 28.

PHANOCLES, an ancient elegiac poet of Greece, who wrote a poem upon an unnatural crime, wherein he supposes that Orpheus was the first who practised it. Some fragments of his poems are extant.

PHANODEMUS, an ancient Greek historian, who wrote on the antiquities of Attica

PHANTASIA, the daughter of Nicarchus of Memphis, in Egypt. It has been said that she wrote a poem on the Trojan war, and another on the return of Ulysses to Ithaca, from which compositions Homer copied the greatest part of his Iliad and Odyssey, when he visited Memphis, where they were deposited.

PHAN'TASM, *n. s.*
PHANTAS'MA,
PHANTAS'TICAL,
PHANTAS'TIC.
Fr. *phantasme*, *phantasie*; Gr. φαντασμα, φαντασια. Vain appearance; something appearing only to the imagination. See FANTASTICAL.

All the interim is
Like a *phantasm* or a hideous dream.
Shakspeare.

This Armado is a Spaniard that keeps here in court
A *phantasm*, a monarcho, and one that makes sport
To the prince and his book-mates. *Id.*

They believe, and they believe amiss, because they be but *phantasms* or apparitions.
Raleigh's History.

If the great ones were in forwardness, the people were in fury, entertaining this airy body or *phantasm* with incredible affection; partly out of their great devotion to the house of York, partly out of proud humour. *Bacon's Henry VII.*

Why,
In this infernal vale first met, thou callest
Me father, and that *phantasm* callest my son.
Milton.

Assaying, by his devilish art, to reach
The organs of her fancy, and with them forge
Illusions, as he list, *phantasms* and dreams. *Id.*

Jesus, in performing his cures and other miraculous works, did never use any profane, silly *phantastic* ceremonies. *Barrow.*

PHANTASM is also sometimes used in a synonymous sense with idea, or notion retained in the mind, of an external object. Locke, who uses this word frequently, tells us that he means the same thing by it as is commonly meant by species or phantasm. Gassendi, from whom Locke borrowed more than from any other author, says the same. The words species and phantasm are terms of art in the Peripatetic system, and from this we are to learn the meaning of them.

PHANTASY, or FANCY, the imagination, sometimes called the second of the powers or faculties of the soul, by which the species of objects received by the external organs of sense are retained, recalled, further examined, and either compounded or divided. See IMAGINATION. Others define the phantasy to be that internal sense or power whereby the ideas of absent things are formed, and represented to the mind as if they were present.

PHAN'TOM, *n. s.* Fr. *phantome*. A spectre; an apparition; visionary appearance.

If he cannot help believing that such things he saw and heard, he may still have room to believe that what this airy *phantom* said is not absolutely to be relied on. *Atterbury.*

As Pallas will'd, along the sable skies,
To calm the queen, the *phantom* sister flies. *Pope.*

A constant vapour o'er the palace flies;
Strange *phantoms* rising as the mists arise:
Dreadful as hermits' dreams in haunted shades,
Or bright as visions of expiring maids. *Id.*

Restless and impatient to try every overture of present happiness, he hunts a *phantom* he can never overtake. *Rogers.*

Bliss! sublunary bliss—proud words, and vain!
Implicit treason to divine decree!
A bold invasion of the rights of heaven!
I clasped the *phantoms*, and I found them air. *Young.*

Then grace the bony *phantom* in their stead
With the king's shoulderknot and gay cockade;
Clothe the twin brethren in each other's dress,
The same their occupation and success. *Cowper.*

PHANUEL, of the tribe of Asher, the father of the prophetess Anna. See ANNA, and Luke ii. 36—38.

PHAON, in fabulous history, a young man of Mytilene, in the island of Lesbos, who received from Venus an alabaster vase filled with an essence which had the virtue of conferring beauty. He had no sooner anointed his body with it than he became the most beautiful of men. The ladies of Mytilene fell desperately in love with him; and the celebrated Sappho threw herself down a precipice, because he would not encourage her passion. He is said to have been killed by a husband who surprised him with his wife. Ovid, in his Epistles, gives a letter from Sappho to Phaon, which Pope has translated into English verse.

PHARA, in ancient geography, a village between Egypt and Arabia Petræa; or, according to Ptolemy, at a promontory situated between the Sinus Heroopolites and Elaniticus of the Red Sea; where Ishmael is said to have dwelt. In Hebrew it is Paran, and in most interpreters; Pharan in the Septuagint and Vulgate.

PHARACYDES, a commander of the Spartan fleet, who assisted Dionysius, tyrant of Syracuse, against the Carthaginians.—Polyæn. 2.

PHARÆ, in ancient geography, three towns, viz. 1. A town of Achaia, in Peloponnesus, on the Pierus, seventy stadia from the sea, and 150 south of Patræ. 2. In Crete (Pliny), a colony from the Pharæ of Messenia.—Stephanus. 3. Pharæ, or Pheræ (Strabo, Ptolemy), or Phara (Polybius), a town of Messenia, on the Nedo (Strabo), on the north side of the Sinus Messenius, and north-west of Abea; anciently read Pharis in Homer (Pausanias, Statius), though now read Phare.

PHARAMOND, the first king of France. He is said to have reigned at Treves, and over a part of France, about A. D. 420, and to have been succeeded by his son Clodio. See FRANCE. The institution of the famous Salique law is generally attributed to him.

PHARAN, or PARAN, the name of the wilderness in the neighbourhood of Phara, adjoining to Kadesh. Also a town of Arabia Petræa, on the Gulf of Suez, formerly a bishop's see, but now much decayed; forty miles north of Tor.

PHARANITÆ, the natives of Pharæ.—Ptolemy.

PHARAOH, Heb. פרעה, i. e. making bare, a common name of the kings of Egypt. Josephus says that in the Egyptian language the word Pharaoh signifies a king; and that those princes did not assume this name till they ascended the throne, when they quitted also their former name. There are ten monarchs of this name mentioned in Scripture, viz.

1. PHARAOH, in whose time Abraham went down to Egypt, when Sarah, who passed only for Abraham's sister, was, by the command of Pharaoh, brought to his palace to become his wife. See ABRAHAM and SARAH.

2. PHARAOH, who reigned when Joseph arrived in Egypt. See JOSEPH and JACOB.

3. PHARAOH, who persecuted the Israelites, and published a decree that all the male children born of Hebrew women should be thrown into the Nile.

4. PHARAOH, before whom Moses performed many miracles, and in whose sight Egypt was visited with ten dreadful plagues. Exod. vii—x. This Pharaoh having at last been compelled to send away the Hebrews, and to suffer them to go out of Egypt, repented of the leave he had given, and pursued them at the head of his army with his chariots. But he was drowned in the Red Sea, wherein he had rashly entered in the eagerness of his pursuit. Exod. xiv. Some historians give us the name of this Pharaoh: Appion calls him Amasis; Eusebius calls him Chenchris; Usher calls him Amenophis.

5. PHARAOH, who gave protection to Hadad, son of the king of Edom, who gave him to wife the sister of his own queen, enriched him with lands, and brought up his son Genubah in his own court. 1 Kings xi. 17—22.

6. PHARAOH, who gave his daughter in marriage to Solomon (1 Kings iii. 1): having taken Gezer, set it on fire, drove the Canaanites out of it, and gave it for a present to Solomon, in lieu of a dowry for his daughter. 1 Kings ix. 16.

7. PHARAOH, or Shishak, who entertained Jeroboam in his dominions when he fled from Solomon. He also declared war against Rehoboam, besieged and took Jerusalem, carried away the king's treasures, and those of the house of God, particularly the golden bucklers that Solomon had made. Some think he was the brother of Solomon's queen, and did this to avenge the neglect of his sister by Solomon. See EGYPT, SHISHAK, aand 1 Kings xiv. 25—29.

8. PHARAOH, with whom Hezekiah made a league against Sennacherib, king of Assyria, A. M. 3290. See SENNACHERIB. He is probably the same whom Herodotus names Sethon, priest of Vulcan, who came to meet Sennacherib before Pelusium, and to whose assistance Vulcan was believed to have sent an army of rats, which gnawed the bow-strings and the thongs of the bucklers of Sennacherib's soldiers. See EGYPT.

9. PHARAOH NECHO, or Nechos, son of Psammiticus, who made war with Josiah, and subdued him. See 2 Chron. xxxv. 20—24. Herodotus also mentions this prince. See EGYPT and NECHO II.

10. PHARAOH HOPHRAH, who entered into an alliance with Zedekiah king of Judah, and attempted to assist him against Nebuchadnezzar

king of Chaldea. Against this Pharaoh Ezekiel pronounced several of his prophecies. See Ezek. xxix. xxx. He is called Apries in Herodotus, I. ii. c. 161. He is also mentioned in Habakkuk ii. 15, 16. See also Isaiah xix. 11, and Jeremiah xlvi. 16, &c. See APRIES and EGYPT.

PHARAON, or FARO, is the name of a game of chance, the principal rules of which are: the banker holds a pack consisting of fifty-two cards; he draws all the cards one after the other, and lays them down alternately at his right and left hand; then the ponte may at his pleasure set one or more stakes upon one or more cards, either before the banker has begun to draw the cards, or after he has drawn any number of couples. The banker wins the stake of the ponte when the card of the ponte comes out in an odd place on his right hand, but loses as much to the ponte when it comes out in an even place on his left hand. The banker wins half the ponte's stake when it happens to be twice in one couple. When the card of the ponte, being but once in the stock, happens to be last, the ponte neither wins nor loses; and the card of the ponte being but twice in the stock, and the last couple containing his card twice, he then loses his whole stake.

De Moivre has shown how to find the gain of the banker in any circumstance of cards remaining in the stock, and of the number of times that the ponte's card is contained in it. Of this problem he enumerates four cases, viz. when the ponte's card is once, twice, three, or four times in the stock. In the first case, the gain of the banker is $\frac{1}{n}$, n being the number of cards in the stock. In the second case his gain is $\frac{(n-2) \times y}{n(n-1)} + \frac{2}{n \times (n-1)}$, or $\frac{\frac{1}{2} n \times 1}{n \times (n-1)}$ supposing $y = \frac{1}{2}$. In the third case his gain is $\frac{3y}{2 \times (n-1)}$, or $\frac{3}{n \times (n-1)}$, supposing $y = \frac{1}{2}$. In the fourth case the gain of the banker, or the loss of the ponte, is $\frac{2n-5}{(n-1) \times (n-3)} y$, or $\frac{2n-5}{2 \times (n-1) \times (n-3)}$ supposing $y = \frac{1}{2}$. De Moivre has calculated a table, exhibiting this gain or loss for any particular circumstances of the play; and he observes that at this play the least disadvantage of the ponte, under the same circumstances of cards remaining in the stock, is when the card of the ponte is but twice in it; the next greater when three times, the next when once, and the greatest when four times. He has also demonstrated that the whole gain per cent. of the banker, upon all the money that is adventured at this game, is £2 19*s.* 10*d.* See De Moivre's Doctrine of Chances, page 77, &c.

PHAREZ, son of Judah and Tamar (Gen. xxxviii. 27, 28, &c.), so named from the circumstance attending his birth, by his mother Pharez, i. e. one breaking forth. His sons are mentioned in Numb. xxvi. 20, 21; and his posterity down to Joseph and Mary, in Matt. i., and Luke iii.

PHAREZITES, the descendants of Pharez.

PHARI. A valley and fortress in the southern part of Tibet, near the Bootan frontier, named also Parry Jeungh and Parisdong. Lat. 27° 58' N., long. 89° 1' E.

The valley of Phari is extensive; and the station of the Phari lama, who is here a sort of prince, being superintendant of a goombah or monastery, and governor of an extensive tract of rocks and deserts, which yield verdure only during the mildest season of the year; at which time this neighbourhood is frequented by large herds of long haired cattle. The musk-deer are also found in great abundance here. There are also partridges, pheasants, quails, and a great multitude of foxes. Winter may be said perpetually to reign in this fortress; the mountain Chumulari is for ever clothed with snow, and from its remarkable form is probably that which is occasionally visible from Phurneah and Rajemall. In the vicinity wheat does not ripen, yet it is sometimes cultivated as forage for cattle. Such is the intensity of the cold here, although in so low a latitude as 28° N., that animals exposed in the open fields are sometimes found dead with their heads split open by frost. In 1792 the Chinese established a military post at this place. The fortress is of an irregular form, but deemed of great strength. On the north-west is an extensive suburb, and on the south a large basin of water.

PHARIS, a town of Laconia.—Paus. iii. c. 10.

PHARISA'ICAL, *adj.* }
PHARISA'ISM, *n. s.* } From Pharisee; Heb. פרם, to separate. Ritual; externally religious.

The causes of superstition are pleasing and sensual rites, excess of outward and *pharisaical* holine , over-great reverence of traditions, which cannot but load the church. *Bacon.*

Suffer us not to be deluded with *pharisaical* washings instead of christian reformings. *King Charles.*

St. Jerome, whom they fondly term their cardinal, compares some popish fashions of his time with the *pharisaical.* *Bp. Hall.*

To some, *Pharisaism* seems rather a several order than a sect. *Id.*

PHARISAISM. Serrarius places the origin of Pharisaism about the time of Ezra; Maldonat makes it only to have arisen a short time before our Saviour's birth. Others, with more probability than either, refer it to the time of the Maccabees.

PHARISEES, a famous sect of the Jews, who distinguished themselves by their zeal for the traditions of the elders, which, they pretended, were delivered to Moses from Mount Sinai along with the law, and therefore both were of equal authority. From their rigorous observance of these traditions, they looked upon themselves as more holy than other men, and therefore separated themselves from those whom they thought sinners or profane, so as not to eat or drink with them; and hence from the Hebrew word פרם, i. e. to separate, they had the name of Pharisees or Separatists. This sect was one of the most ancient and most considerable among the Jews; but its original is not well known. Serrarius places their rise about the time of Esdras, because it was then that the Jews first began to have interpreters of their traditions. Maldonet, on the other hand, thinks it cannot have arisen among the Jews till a little before the time of Christ. Others, perhaps with more probability, refer the origin of the Pharisees to the time of the Maccabees. Dr. Lightfoot contends, that Pharisaism rose up gradually, from a period which he does not assign, to the maturity of a sect; and it is certain from Josephus, that in the time of John Hyrcanus, the high-priest and prince of the Asmonean line, about 108 years before Christ, this sect was not only formed, but made a considerable figure; as also that it had advanced to a high degree of popularity and power about eighty years before Christ. Calmet places their origin about A. M. 3820, B. C. 184. According to Basnage, Aristobulus, an Alexandrian Jew, and a Peripatetic philosopher, who flourished about 125 years before Christ, and wrote some allegorical commentaries on the Scripture, was the author of those traditions, by an adherence to which the Pharisees were principally distinguished.

This sect was in great repute in the time of our Saviour. They held a resurrection of the body, and supposed a certain bone to remain uncorrupted, to furnish the matter of which the resurrection body was to be formed. They did not, however, believe that all mankind were to be raised from the dead. A resurrection was the privilege of the children of Abraham alone, who were all to rise on Mount Zion; their incorruptible bones, wherever they might be buried, being carried to that mountain below the surface of the earth. The state of future felicity in which the Pharisees believed was very gross: they imagined that men in the next world, as well as in the present, were to eat and drink, and enjoy the pleasures of love, each being re-united to his former wife. Hence the objection stated by the Sadducees, which our Saviour so satisfactorily refuted.—See Matt. xxii. 23—33. The Pharisees seem to have had some confused notions, probably derived from the Chaldeans and Persians, respecting the pre-existence of souls; and hence Christ's disciples asked him concerning the blind man.—See John ix. 2. With the Essenes, they held absolute predestination; and with the Sadducees, free-will; but how they reconciled these seemingly incompatible doctrines is no where explained. The sect of the Pharisees was not extinguished by the ruin of the Jewish commonwealth. The greatest part of the modern Jews are still of this sect; being as much devoted to traditions or the oral law as their ancestors were. See KARAITES, ESSENES, SADDUCEES, &c.

PHARITÆ, people of Pharis. See PHARÆ.

PHARMACA, among the ancients, meant medicated or enchanted compositions of herbs, minerals, &c., some of which, when taken inwardly, were supposed to cause blindness, madness, love, &c.; others infected by touch; such was the garment sent by Medea to Creusa, prepared secundum artem; and others operated upon persons at a distance. Pharmaca soteria were employed as antidotes against these mischievous compositions: thus the herb moly preserved Ulysses from the magical influence of Circe. The laurel, the rhamnus, the flea-bane, the jasper-stone, were used for similar purposes. See Potter's Græc. Ant.

PHARMACI, in antiquity, were two persons who were employed in the lustration or purification of cities. Some say they were both men; but others maintain that a man to represent the males, and a woman to represent the females, performed this office. They performed sacrifice, and wore figs about their necks called ολκαδης; those of the man were blackish, and those of the woman white. Figs were an emblem of fertility.

PHARMACITIS. See AMPELITES.

PHARMACO-CHEMIA, a branch of the chemical art, which treats of the preparation of medicines. It is so named by way of distinction from Spagarico-chemia, a species of chemistry wholly employed about the transmutation of metals by the philosopher's stone.

PHARMACOPŒIA, (from Greek φαρμακον remedy, and ποιειν to make), means a treatise describing the preparations of medicines, with their uses, manner of application, &c. We have various pharmacopœias, as those of Bauderon, Quercetan, Zwelfer, Charas, Bates, Salmon, Lemery, Lewis, &c. The latest and most in esteem are the Edinburgh and London dispensatories. See PHARMACY.

PHARMACOPŒIUS, or PHARMACOPOLA, an apothecary; or a person who prepares and sells medicines. See APOTHECARY. The word is seldom used but by way of ridicule. It is from Greek φαρμακον and πωλειν to sell. See Horace, Satire 2, lib. i. ver. i.

PHARMACUM. Greek φαρμακον. A medicament or medicine; whether of a salutary or poisonous quality

PHARMACY.

PHARMACEU'TIC, *adj.*
PHARMACEU'TICAL,
PHARMACOL'OGIST, *n.s.*
PHARMACOPŒ'IA,
PHARMACOP'OLIST,
PHAR'MACY.

Gr. *φαρμακευτικος, φαρμακον*, and λεγο; *φαρμακον* and *ποιεω* (Fr. *pharmacopée*) *φαρμακον* and *πωλεω, φαρμακον* (Fr. *pharmacie*). All from *φαρμακον*, a medicine. Pharmaceutic and pharmaceutical are, relating to the knowledge or preparation of medicines: pharmacologist, one who writes upon drugs or medicines: pharmacopœia, a dispensatory or book containing rules for making or compounding medicines: pharmacopolist, one who sells them: pharmacy, the art or practice of preparing medicines. See below.

Each dose the goddess weighs with watchful eye,
So nice her art in impious *pharmacy*. *Garth.*

The osteocolla is recommended by the *pharmacologists* as an absorbent and conglutinator of broken bones. *Woodward on Fossils.*

PART I.

PHARMACY may be defined the art of preparing, combining, compounding, and preserving, those substances which are employed in medicine.

Authors who treat of it usually commence their disquisition by engaging in the consideration of chemical principles. Thus the table of arrangement presented by one of the most modern and able writers on the science in question is as follows:—

SECT. I.—Of the more general agents influencing pharmaceutical combinations, including 1. Attraction; *a.* attraction of aggregation; *b.* chemical attraction or affinity; 2. Repulsion. Powers by which it is produced: caloric, light, electricity, and galvanism.

SECT. II.—Of the constitution and combinations of substances. 1. Of solids. 2. Of fluids. 3. Of aëriform substances or gases.

SECT. III.—Of pharmaceutical operations, and the description of the apparatus.

This arrangement of Dr. Thomson is exceedingly perspicuous, and calculated to convey just notions of the principles of the science; but, as the subjects of the two first sections have been considered under the head of CHEMISTRY, we refer our readers to that article, and proceed directly to the more immediate objects of pharmaceutical science: viz. that of effecting changes of an artificial kind in medicinal substances which are presented simple by the hand of nature.

Pharmaceutical operations may be said to be either mechanical or chemical; the first applying to alteration of mode; the second effecting a change of essence. Thus pulverisation, trituration, levigation, granulation, are instances of the mechanical division of bodies; while sifting, washing, filtration, are modes of mechanical separation of their parts; the former being the application of a power or powers to overcome the cohesive force by which the particles of bodies are held together, the bodies still retaining their identity as to quantity, the latter consisting of modes of taking one portion of a mass from another.

The chemical changes effected in substances by pharmaceutical processes are arranged in three classes: 1. Operations which produce changes by a separation of their constituent parts without any manifest decomposition. (It is sometimes difficult to say where mechanical change ceases and chemical change commences, and it is in this link of combination between formative and essential change that the operations in this first division are to be arranged.) 2. Operations in which bodies acting upon each other produce obvious decomposition, or essentially change the nature of such bodies. 3. Operations in which combinations of bodies with oxygen are effected by means of augmented temperature.

MECHANICAL OPERATIONS.

1. *Pulverisation.*—This consists in reducing substances to powder by beating, or forcibly overcoming the aggregative attraction by which the particles of bodies cohere. It is usually performed in mortars, which are made of various materials according to the substances acted upon, for in some cases the materials of the mortar would enter into chemical combination with the matter employed, and thus the process would be interfered with. Mortars are principally made of marble, iron, brass, glass, porcelain, or Wedgewood's ware. Of whatever materials mortars are made, they should be internally at bottom of the form of a hollow hemisphere, and their sides should have such a degree of inclination as to make the substances fall back to the bottom every time the pestle is lifted. The operation, however, is retarded when too great a portion of the ingredients falls under the pestle; hence a large quantity of any substance should not be put into the mortar at a time, and the finer parts should from time to time be removed.

Vegetable matters require to be dried before they can be pulverised; and woods, roots, and barks should be previously cut, chipped, or rasped. When roots are very fibrous, as those of ginger for example, it is advisable to cut them diagonally, which prevents the powder from being full of hair-like filaments. Resins, and gum resins, which soften in a moderate temperature, or in warm weather, should be powdered in cold weather, and only gently beaten to prevent them from running into a paste instead of forming a powder; and when the powdered substance is intended to be dissolved in any menstruum except a pure alkali, the pulverisation is much facilitated by mixing them with a portion of clean well washed white sand. The pulverisation of camphor is assisted by the addition of a few drops of alcohol; sugar is the best addition to aromatic oily substances as nutmegs, mace, &c.; and to the emulsive seeds some dry powder must be added, without which they cannot be reduced to powder. Metals which are scarcely brittle enough to be powdered, and yet are too soft to be filed, as zinc for instance, 'may be powdered while hot in a heated iron mortar; or metals may be rendered brittle by alloying them with a small quantity of mercury; but as metals are not required to be reduced to the state of very fine powder for pharmaceutical purposes, those processes are seldom performed.'

Trituration as to effect is the same as pulverisation by beating; it is produced by a rotatory motion of the pestle, or upon a large scale by rollers. Dr. Thomson remarks that the fine powders kept in the shops are generally ground in this manner; but there appears to be an error in reducing vegetable matters to the state of impalpable powder; for in this state, both during the process of grinding and afterwards, the air and light act powerfully upon them, and produce changes which, although they are not well understood, yet appear to alter the medicinal virtues of the substances.

Levigation is in fact trituration assisted by the addition of a fluid, which does not act chemically, or as a solvent, upon the material. This process is usually performed upon a flat stone, and the rubbing is effected by a muller of the same material with the stone. Earths are thus prepared for pharmaceutical purposes, and also some of the metals. Water or spirits of wine, or some unctuous material, are usually employed in levigation, and the substances used in the operation are for the most part previously pulverised.

Granulation is used for the mechanical division of some of the metals. The substance is melted or beaten into fine leaves, and then stirred briskly until it cools; or it is poured in its melted state into water, and stirred or agitated till it cools. The process is called granulation, on account of the metallic particles being separated by it in the form of small grains.

Rasping and filing scarcely need be mentioned as modes of dividing substances.

Sifting consists in separating the finer from the coarser parts of substances, by causing the former to pass through apertures in sieves formed of iron wire, hair cloth, or gauze. For very light and valuable powders it is necessary to employ close sieves, otherwise a great deal of the matter would be lost in the agitation.

Washing or *elutriation* consists in agitating the material in a fluid which does not act upon it as a solvent, but merely suspends it. The liquor containing thus the finer particles of the material is poured off from the sediment, and suffered to remain at rest for some time, when these fine and washed particles gradually settle, and the supernatant water is poured off, or drawn from the material by a syphon.

Filtration is a species of fluid sifting; filters are generally made of fine close flannel, or linen, or unsized paper, called filtering paper. When these are large it is usual to form them into a conical bag, and suspend this bag from a hoop or frame. When paper is employed it is doubled up in the shape of a cone, and inserted into a funnel; it is often requisite to introduce glass rods between the paper and the funnel, in order to prevent the sides of the paper and funnel from being so closely in contact as to interfere with the percolation. When very acrid liquors, such as the strong acids and alkalis, require filtration, the glass funnel that is employed is partly filled with powdered quartz, and sometimes sand placed over this, so arranged that the coarser materials shall be at the bottom of the funnel, and the finer on the surface. The substance to be filtered is poured on the surface of the sand slowly, which it passes through, as also the lower substrata, and thus are the impurities of the liquor left behind.

Expression is a species of filtration: but in this last case force is employed. Expression is principally employed to obtain the juices of fresh vegetables, and the unctuous vegetable oils. The material is first beaten or bruised, then enclosed in a bag, not completely filled, and subjected to pressure between the plates of a screw press. The pressure should be applied gradually.

Vegetables treated in this manner ought to be perfectly fresh; and they should for the most part be subjected to the pressure immediately upon being bruised, for the bruising disposes them to ferment. But subacid fruits yield more juice, and of a better quality, when they are permitted to stand a few days in a wooden or earthen vessel previous to pressure. Sometimes when the vegetable matter to be expressed is not very juicy, the addition of a little water is necessary. It is proper to peel oranges and lemons before they are pressed, in order to prevent the essential oil of the rind from mixing with the expressed juice. For unctuous seeds iron plates are used in expression, and the bruised seeds may be previously subjected in a bag to the steam of hot water.

Despumation is employed in the instance of fluids being so thick and clammy as not to pass with facility through a filter. The liquor is heated, and thus throws up a scum, which is to be carefully removed; or more generally whites of eggs are employed in the process of despumation; this entangles the impurities of the fluid and rises up with them to the surface. In the case of clarifying spirituous liquors isinglass may be employed, for the process which coagulates in the spirit without the assistance of heat, and forms a scum which descends to the bottom of the vessel, and carries the impurities with it.

'Besides the above methods of mechanically separating the parts of substances from one another, fluids of different specific gravities, mixed together, are separated by means of the separatory funnel. It is chiefly used for separating the essential oils from the water with which they are entangled during their distillation. The funnel is first stopped at the bottom, and then filled with the mixed fluids, the heaviest of which gradually subsides into the narrow part below; and when the cork at the bottom is taken out, and the stopper above a little loosened, it flows out; by which means the lighter is easily obtained in a separate state. Some of the essential oils are heavier, others lighter than water; but both can be thus separated with equal facility.'

The above quotation is from Dr. Thomson: and in what follows respecting the chemical operations of pharmacy we shall be principally indebted to the publication of that author.

The changes of which we have above spoken, as in some sort holding an intermediate place between mere formative and absolutely essential alteration, are effected by 1st, Caloric, inducing liquefaction, fusion, evaporation, exsiccation, distillation, rectification, dephlegmation, sublimation; by 2d, Water, and other fluids, causing solution, lixiviation, maceration, digestion, infusion, decoction, extraction; 3d, By other chemical agents inducing coagulation.

Calorific changes. Liquefaction.—This term is applied to that operation by which certain bodies, when exposed to a moderate heat, are rendered fluid after passing through several intermediate states of softness. Fat, lard, wax, resin, and many other similar bodies, undergo liquefaction; which is therefore employed in pharmacy to facilitate the combination of these bodies in the formation of ointment. The best vessels for conducting the process of liquefaction are earthenware pans.

Fusion differs from liquefaction in the sudden change from the solid to the fluid state, which those bodies which are liable to it suffer on exposure to heat. There are no intermediate states of softness; but the fusible body, when heated to a certain point, immediately assumes the fluid form. This point differs very considerably in different solids; but in general simple substances are less fusible than compounds; and some of the simple earths cannot be fused without the addition of some other substances to promote their fusion. These are generally saline bodies, and are denominated fluxes. Fusion is usually performed in crucibles, the best of which are made of very pure clay or potter's earth. They are made of various forms, three cornered, or round, and fitted with covers.

Crucibles are also made of cast-iron, of fine silver, and of platina. The first, however, are destroyed when saline substances are melted in them; and when made red hot in a current of air are apt to suffer oxidation; but in other respects they are durable, and can sustain sudden alternations of heat and cold without cracking. Some of the metallic crucibles combine many of the best qualities necessary for this set of instruments; particularly those of platina: which, however, are too expensive for ordinary use.

Evaporation is the dissipation of a liquid by means of heat, and is employed in pharmacy generally with the view of obtaining in a separate state any fixed substance which may be combined with water or some other evaporable fluid. Thus, by exposing an aqueous solution of a salt to a certain degree of heat, the caloric which combines with the water renders it volatile, and disperses it in the form of an elastic aëriform fluid; while the particles of the salt, being brought nearer to each other, and within the sphere of their mutual attraction, reunite, and the salt is obtained in its concrete state. In spontaneous evaporation the air is the principal agent, the dissipation being independent on artificial caloric or increased temperature. It is easy to conceive that the process of evaporation is only had recourse to when the part of the body which is thus dissipated is of little value; when a solid is to be separated from a more valuable fluid, such as alcohol, distillation and not evaporation is employed.

Evaporating dishes are made of different materials; the best are those of biscuit porcelain made by Wedgewood. When glass or earthenware dishes are employed the heat is best applied through the medium of sand; or, if a still more moderate heat be necessary, by means of boiling water over which the evaporating dish should be placed. The first is named a sand-bath; the second a water-bath. Evaporating dishes in the general way should be flat-bottomed and shallow, so as to expose a large surface to the action of the applied heat.

Exsiccation is a variety of evaporation. It is generally employed for depriving salts of their water of crystallisation. The bodies to be exsiccated are heated in an iron ladle or pot, and undergo first what is called the watery fusion, that is, are heated and dissolved in their own fluid; this fluid, by continuing the process, is evaporated, and the body is left in the form of a dry mass. When the substances to be exsiccated are liable to decomposition in a temperature above 212°, as is the case with some of the compound oxides, the process must be conducted by the heat of a water-bath.

Distillation is also a species of evaporation, differing from it only in this, that the vapor of volatile matter, instead of being dissipated and lost in the air, is collected and condensed in close vessels. Some of the vessels used in this process will be found in the plates appended to the article CHEMISTRY. The simplest is the retort and receiver. The common still is a well known apparatus. It consists of two parts, the boiler, and the head or capital. The boiler, which is the part to which the fire is applied and contains the materials, is of a cylindrical shape, and may be sunk in a furnace or immersed in a water-bath when the temperature requires to be nicely regulated. The head or capital is a large hollow globe, the upper part of which is drawn out into a tapering pipe bent to a curve or arch, and terminating in the serpentine or worm. These parts are generally made of copper; but the worm is a long pewter pipe of a decreasing diameter which winds in a spiral direction obliquely through a deep tub filled with cold water. The body, head, and worm require to be luted together; but in general slips of paper dipped in flour, paste, or pieces of wet bladder, are sufficient for this purpose. In this apparatus the vapors are raised into the head, whence they pass into the worm, where they are condensed and issue in drops from the lower end of the pipe. By degrees the water in the refrigeratory becomes warmed and requires to be renewed, and thence the necessity of the tube being furnished with a stop-cock, by which the heated water may be drawn off without disturbing the apparatus. As in this species of distillation the vapor ascends before it is condensed, it is named distillation per ascensum. The distillation by the retort or cucurbit is named distillation per latus.

In some cases, as in the distillation of several essential oils, the vapor, instead of passing laterally or ascending, is forced to descend. To produce this effect a plate of tinned iron is fixed within any convenient vessel so as to leave a space beneath it; and, the materials to be distilled being laid upon this, they are covered by another plate, accurately fitted to the sides of the vessel, and strong enough to support the fuel which is burnt upon it. By this means the volatilised matter of the materials under the fire is forced into the lower cavity of the vessel and there condensed. This mode of distillation is denominated distillation per descensum. For an account of Woulfe's apparatus, and its modifications, see plates of CHEMISTRY.

Rectification is the repeated distillation of any product obtained by distillation, when it is not perfectly pure. This second operation is carried on at a lower temperature, so that the more volatile parts only are raised and pass over into the receiver, leaving the impurities behind. When the fluid is simply rendered stronger, as in the case of alcohol, by bringing over the spirit and leaving behind the superfluous water, the operation is named dephlegmation, or concentration. When the liquid is distilled off from any substance the process is called abstraction; and cohobation if the product be redistilled from the same materials, or from a fresh parcel of the same materials.

Sublimation is a species of distillation in which the product of volatilisation is condensed in a solid form; but, as this condensation takes place at a higher temperature than that of watery vapor, a much more simple apparatus is required. The process is conducted sometimes in a crucible, with a cone of paper or another crucible inverted over it, in which the product is condensed; and, as in this case it is light and spongy, it was formerly denominated flowers. For other matters which are less volatile a cucurbit and capital, or a flask and phial, are employed, and sunk about two-thirds in a sand-bath. In these cases the product is a solid, and is denominated a sublimate.

CHANGES BY THE ACTION OF FLUIDS.

Solution.—For an account of the laws and circumstances of this process, see the article CHEMISTRY.

Lixiviation.—When a saline body consists of both soluble and insoluble ingredients, the solvent of the former, acting upon the salt, produces lixiviation, which process, when conducted on a great scale, is generally performed in large tubs or vats having a hole near the bottom containing a wooden spigot and faucet. A layer of straw is placed at the bottom of the tub, over which the substance is spread, and covered by a cloth; after which hot or cold water, according as the salt is more or less soluble, is poured on. The water, which soon takes up some of the soluble parts of the saline body, is after a little while drawn off by the spigot; and a fresh portion of water is successively added and drawn off until the whole of the soluble matter is dissolved. The straw in this operation acts as a filter, and the cloth prevents the water from making a hollow in the ingredients when it is poured on, by which it might escape without acting on the whole of the ingredients.

In smaller operations lixiviation may be conducted in glass matrasses, and the lie, which is the name given to the solution, filtered through paper in a glass funnel.

By *maceration* soluble portions of substances, chiefly of a vegetable nature, are obtained in solution; these substances being immersed in cold water or in spirituous fluids for a sufficient length of time. It is frequently employed as a preparation for infusion and decoction, which are always rendered more effective by the previous maceration of the materials.

Digestion is similar to maceration, except that in this last case the power of the fluid is assisted by a gentle heat. It is usually performed in a glass matrass, and the evaporation of the liquid impeded by stopping the mouth of the matrass slightly with a plug of tow, or tying over it a piece of wet bladder perforated with small holes. When the menstruum is valuable, as alcohol for instance, another matrass with a smaller mouth may be inverted over the former and the joining secured by a piece of wet bladder; or, what is perhaps preferable, a long open glass tube may be luted to the mouth of the matrass which contains the materials. By these means any part of the liquor which is resolved into steam by the heat is condensed and conveyed back upon the materials. The matrass may be either heated by a common fire, or a lamp, a water-bath, or a sand-bath; and, when either of the latter is used, the matrass should not be sunk deeper in the water or the sand than the portion that is filled. The process has been denominated circulation, when the condensed vapors are returned upon the ingredients.

Infusion is intended chiefly to extract the volatile and aromatic principle of vegetables, which would be dissipated by decoction or digestion; and also those parts of vegetables which are more readily soluble in water, as gum, sugar, extract, tannin, the salts and part of the resin from the insoluble parts. The water is poured boiling hot on the materials, sliced, or reduced to a coarse powder, and kept in a closely covered vessel till they are cold, when the infusion or liquor is decanted off for use. Infusions are sometimes effected with cold water; but for the most part these though more grateful are weaker than the infusions by heat.

Decoction, or boiling, is employed with advantage to extract the mucilaginous parts of plants, as well as their bitterness and several other vegetable principles which do not easily yield to mere infusion. It is generally performed in slightly covered vessels; but when the menstruum is valuable, as alcohol for instance, a retort and receiver, or the common still may be used, in the body of which the decoction is prepared, while the vapors, which otherwise would escape, are condensed and preserved.

Extraction.—If the liquor obtained by either infusion or decoction be subjected to evaporation the watery part is dissipated, and the part which is extracted by it is obtained in the solid form, and is denominated an extract. It is obvious enough that extract of some materials will not contain the whole of the principles of those meterials.

Changes by Chemical Agents.

Coagulation.— This is the conversion of a fluid into a solid of more or less consistency. The means employed to effect this are increase of temperature, alcohol, acids, and runnets. The effect appears to arise from a new arrangement of particles produced by the affinity exerted between the solid particles contained in the fluid and the coagulating substance.

Changes produced by the Chemical Action of one set of Bodies on another.

Decomposition.—This implies the separation of the component parts of bodies from one another. It is produced in some cases by heat so as to overcome the affinity of aggregation. Electricity or Galvanism may also effect decomposition; but in the greater number of instances it is the result of a superior affinity that holds the principles of the substance about to be decomposed in union, and produces new compounds.

In pharmaceutical operations decomposition is very frequent, and it is of the utmost importance for the prescribers of medicine to be acquainted with its general circumstances.

Dissolution.—This differs from mere solution by its being necessarily accompanied by some change in the nature of the dissolved body. In general effervescence is caused by the process, the disengaged materials becoming extracted in a gaseous form. The making a common saline draught is an instance of dissolution.

Precipitation.—Here also decomposition occurs, but the substance extricated is thrown down instead of otherwise separating itself. The material used to produce this separation is called the precipitant, and the separated substance the precipitate. It is necessary for the prescriber to be acquainted with those substances which, when mixed with others, produce precipitation, otherwise he will often be foiled in attempting the combination of incompatible principles. The following table of precipitants is extracted by Dr. A. T. Thomson, from the System of Chemistry by Dr. Thomas Thomson; all the substances not employed in pharmacy being omitted:—

	Precipitants.
1. Alkalies.	
Potash	Tartaric acid.
Soda	0
Ammonia	Fixed alkalies.
2. Alkaline Earths.	
Barytes	Sulphuric acid, sulphates.
Lime	Oxalic acid, oxalates.
Magnesia	Phosphoric acid, phosphate of soda (not direct).
3. Earths Proper.	
Alumina	Ammonia, hydro-sulphuret of potassa.
4. Metallic Oxides.	
Silver	Muriate of soda.
Mercury	Muriate of soda.
Copper	Iron.
Iron	Succinate of soda, benzoate of soda.
Lead	Sulphate of soda.
Zinc	0 alkaline carbonates ?
Antimony	Water, hydro-sulphuret of potassa.
Arsenic	Nitrate of lead.
5. Acids.	
Sulphuric	Muriate of barytes.
Carbonic	Muriate of an alkaline earth.
Boracic	Sulphuric acid.
Nitric	0
Acetic	0
Benzoic	Muriatic acid.
Succinic	Sulphate of iron.
Oxalic	Muriate of lime.
Tartaric	Potassa.
Citric	Acetate of lime.

In some cases where decomposition is effected by the addition of another substance, the separated body is not precipitated, but rises to the surface, and is thence denominated a cream: thus, by the addition of any acid to a solution of soap, the alkali unites with the acid, while the oil is separated and swims on the surface of the liquor.

Crystallisation.—See Chemistry.

Fermentation.—For an account of those changes which vegetable substances undergo when separated from the living plant, and placed under certain circumstances so as to act upon one another; and for the different compounds and principles which are severally the results of the vinous, acetous, and putrefactive fermentations, whether naturally occurring or artificially produced, see also the article Chemistry.

Having thus premised an account of the general principles of pharmaceutic science, with its application to medicinal purposes, we now proceed to detail the several processes ordered in the London and Edinburgh Pharmacopœias; and in this, the main part of the present article, we shall follow the plan adopted by Dr. A. T. Thomson, giving first the translations of the directions ordered by the colleges, and then some few remarks on the qualities of the composition. In respect to that portion of the treatise which relates to the incompatibility of one substance with another, Dr. Thomson will be wholly our guide. It should, however, be premised that chemical niceties may in some few instances succumb before actual observations on the effects of compounds.

We do not include the articles of the Dublin Pharmacopœia, fearing too great extension of the paper; and we may here take occasion to say that it is much to be lamented that one general prescription is not adopted throughout the whole of the united kingdom. In an appendix, however, will be found some of the more recent remedies, principally of the French school, which the Dublin college has recently adopted.

PART II.

ACIDS.

In the article Chemistry, and under the word Acid, will be found remarks on the principle of acidification and the composition of acids. It will there be seen that all acids having been supposed compounds of oxygen with certain bases, the name of the particular acid was taken from the base, and the terminations *ic* and *ous* were employed to indicate the degree of oxidation, or rather of acidification; thus sulphur combined with a particular measure of oxygen was named sulphureous acid, with a greater quantity, or to a saturating point, sulphuric. The recent changes which chemistry has undergone have materially modified these the Lavoisierean principles of composition and nomenclature; but they are to a certain extent correct, and have been received by the framers of the Pharmacopœias.

In the following account of the acids, the alphabetical arrangement will be adopted according to the London Pharmacopœia; but it may be right in the first place to copy Dr. Thomson's table of arrangement, according to their radicals or bases:—

1. Acids composed of a simple radical and Oxygen.

Sulphur .	1. Sulphuric acid.
Azote . .	2. Nitrous acid. 3. Nitric acid.

. Acids composed of a compound Radical and Oxygen.

Carbon and hydrogen	1. Acetic acid. 2. Citric acid. 3. Benzoic acid. 4. Succinic acid.

3. Acids composed of a simple radical and Chlorine.

Hydrogen .	1. Muriatic acid.

Acidum aceticum dilutum. London.—Diluted acetic acid.

Let dilute acetic acid be distilled from a glass retort into a glass receiver kept cool; let the first pint be thrown away, and preserve the six succeeding pints.

Acidum aceticum tenue. Edinburgh.—Weak acetic acid.

Distil eight pounds of vinegar in a glass vessel with a gentle heat. Throw away the pound which first comes over; and the five pounds which follow will be the weak acetic acid. The distillation may be continued so long as a colorless acid comes over; but this, being too much burnt and unfit for internal use, may be mixed with the pound that first comes over, and kept for various chemical purposes.

Of the appellations given to this preparation Dr. Thomson considers that of the Edinburgh College the only unobjectionable one; the preparation being the acetic acid in a more diluted state than that in which it exists in vinegar, but purer, being freed in a great degree from the mucilage, extractive, supertartrate of potassa, and other extraneous matters which vinegar contains.

Qualities.—Distilled vinegar ought to be colorless and transparent, and of a specific gravity from 1·007 to 1·0095. Its taste is pungent, and purely acid. It is sometimes adulterated with sulphuric acid; but the adulteration may be detected by a precipitate being produced when acetate of barytes in solution is added. When lead and tin are the adulterating materials, the addition of a solution of sulphureted hydrogen throws down a dark-colored precipitate; if copper have been employed in the adulteration, the acid will become blue by being supersaturated with ammonia.

Medical properties.—It is fitter for pharmaceutical purposes than common vinegar, on account of its greater purity, and from not being liable to decomposition. Its medical uses are the same.

Acidum aceticum forte. Edinburgh.—Strong acetic acid.

Take of sulphate of iron dried one pound, superacetate of lead ten ounces. Having rubbed them together, put them into a retort, and distil in a sand-bath with a moderate heat, so long as any acid comes over.

This acid differs from distilled vinegar only in being stronger and purer. Acetic acid may also be prepared by applying a decomposing temperature to the metallic acetates, which was formerly ordered to be done by the London College, or by mixing the sulphuric acid with the acetate, or by mixing the acetates and sulphates together.

Qualities.—Acetic acid is very pungent to the taste; it has a grateful odor; it is very volatile; its specific gravity is 1·063. It unites with water in any proportion; and, during the mixture, heat is evolved.

Medical properties.—It is rubefacient when applied to the skin, and may be employed to produce speedy vesication; but it is principally used for correcting impurities in the air, and as a refreshing scent in cases of faintness or hysteric affection.

Acidum benzoicum. London.—Benzoic acid. Take of benzoin one pound; put it into a glass vessel placed in a sand-bath, and subjected to a heat of 300° gradually augmented; sublime until nothing more ascends; press the matter sublimed between bibulous paper, that the oil may be separated; then sublime again with a heat not raised above 400°.

Edinburgh.—Take of benzoin twenty-four ounces, subcarbonate of soda eight ounces, water sixteen pounds. Triturate the balsam with the subcarbonate; then boil them in water for half an hour, constantly agitating them. Strain. Repeat the boiling with other six pounds of water, and strain. Mix the strained liquors and evaporate them to two pounds. Again filter, and drop into it diluted sulphuric acid so long as any precipitation is produced.

Dissolve the precipitated benzoic acid in boiling water; strain the solution, while still hot, through linen, and set it aside to crystallise. Wash the crystals with cold water; then dry and preserve them.

Qualities.—Benzoic acid possesses an agreeable taste, rather pungent, and a fragrant smell. It appears in the form of feathery flocculent crystals, quite white, and of a silky character. Its specific gravity is 0·657. When heated it gives out a strong suffocating vapor. It is soluble in twenty-four times its weight of boiling water. Cold alcohol takes about one half its weight; boiling alcohol its own weight.

Medical properties.—Not much used in medicine, although retained in the pharmacopœias; its medicinal efficacy is indeed questionable; it forms an ingredient in the compound tincture of camphor of the London, and of the ammoniated tincture of opium of the Edinburgh College.

Acidum citricum. London.—Citric acid.

Take of lemon juice a pint; prepared chalk an ounce, or sufficient to saturate the juice; diluted sulphuric acid nine fluid ounces. Add the chalk gradually to the lemon juice heated, and mix them; then pour off the liquor. Wash the citrate of lime which remains in repeated quantities of warm water, and then dry it. Pour on the dried powder the diluted sulphuric acid, and boil for ten minutes; then strain the liquor through a linen cloth by strong pressure, and filter it through paper. Evaporate the filtered liquor with a gentle heat, so that crystals may form in cooling. In order that the crystals may be obtained pure, let them be dissolved in water a second and a third time, filtered each time, and set apart for crystallisation.

In this process it is obvious enough that the lime of the chalk unites with the citric acid existing in the lemon juice, and forms an insoluble citrate of lime, which is decomposed by the sulphuric acid, leaving the citric acid free.

Qualities.—The crystals should be white and transparent; they are without smell, but are of a caustic sharp taste. They are soluble in water. When adulterated with tartaric acid, the adulteration may be detected by addition to the solution of them of nitrate, sulphate, or muriate of potassa, or saturating it with carbonate of potassa, when, if the tartaric acid be present, an insoluble super-tartrate of potassa will appear in small bright crystals; should citrate of lime still remain among the crystals, it is detected by dissolving them in water, saturating the solution with ammonia, and adding to it some oxalate of ammonia, which will precipitate the lime. If sulphate of potassa be present, it will be discovered by the solution yielding a precipitate with muriate of barytes, this being insoluble in muriatic acid.

Medical properties.—The same as lemon juice; in some particulars being superior, in others inferior. It wants the freshness of the acid immediately from the fruit, but it is much more convenient for extemporaneous use than common lemon juice. It is said to equal this last in strength when dissolved in eight waters. Nine drachms and a half of the crystals to a pint of water is the proportion that Dr. Thomson gives for the formation of lemon juice, and we copy from him the following table, showing the quantity of citric acid required to decompose one scruple of the alkaline salts mentioned in it.

Alkaline Salts.	Citric Acid.
Carbonate of soda . . .	gr. x.
Subcarbonate of soda . .	gr. xij.
Carbonate of potassa . .	gr. xv.
Subcarbonate of potassa .	gr. xviij.
Subcarbonate of ammonia	gr. xxvj.

A solution of one scruple in a pint of water, sweetened with sugar that has been rubbed on fresh lemon peel, forms a grateful refrigerant beverage, resembling lemonade, and which is equally useful in febrile and inflammatory complaints.

Acidum muriaticum. London.—Muriatic acid.

Take of dried muriate of soda two pounds, sulphuric acid twenty ounces by weight, distilled water a pint and a half. First mix the acid with half a pint of the water in a glass retort, and add the muriate of soda after the mixture is cold. Pour the rest of the water into the receiver; then having fitted on the retort placed in a sand bath, distil the muriatic acid over into this water with the heat gradually raised to redness.

The specific gravity of this acid is 1·160, and 100 grains of it are saturated by 124 grains of the subcarbonate of soda in crystals.

Edinburgh.—Take of muriate of soda which has been previously exposed to a red heat, sulphuric acid and water of each two pounds. Pour the acid mixed with eight ounces of the water and cooled upon the muriate of soda in a glass retort, to which a receiver is to be adapted containing the remainder of the water; then distil from a sand-bath with a moderate fire. In a short time the vessels may be luted together, and the distillation continued to dryness. The specific gravity of this acid is 1·170.

'These processes were formerly explained by saying that the decomposition of the muriate of soda is affected by the superior affinity of sulphuric acid for soda, aided by the affinity of the muriatic acid for soda being weakened by the heat, which favors its tendency to assume the elastic form, in which state it passes over into the receiver, and is there condensed by the water. But, as the doctrine of chlorine is now admitted, we must adopt the following explanation of Sir Humphry Davy, who regards dry common salt as a compound of thirty-six parts of chlorine and twenty-four of sodium, and consequently containing neither muriatic acid nor soda. In the processes of the Pharmacopœias, therefore, for obtaining muriatic acid, the water of the sulphuric acid is decomposed, its oxygen unites to the sodium, and forms soda, which, combining with the sulphuric acid, produces a sulphate of soda; while the hydrogen of the decomposed water combines with the chlorine and forms hydrochloric acid, or muriatic acid gas: a gaseous fluid consisting of equal volumes of hydrogen and chlorine, or by weight, of hydrogen 2·7, chlorine 97·3, in 100 parts, which dissolving in the water contained in the receiver constitutes the liquid acid. The residue of the process is sulphate of soda with an excess of acid; to separate which, without breaking the retort, boiling water may be poured into the retort after its contents have cooled down to 212°.' See Chemistry and Acid.

Qualities.—The liquid acid thus obtained is nearly colorless, with a very caustic taste and a pungent odor. 'According to the new nomenclature the muriatic acid of the shops is hydrochloric acid, or, to retain the common name, hydro-muriatic acid. The real acid contained in the liquid acid is a compound of equal volumes of chlorine and of hydrogen. The fluid muriatic acid found in the shops often contains sulphuric acid with small portions of iron and sometimes copper; the first is diluted by diluting the acid with five or six parts of distilled water, and adding a few drops of muriate of barytes, which is precipitated white if sulphuric acid be present; iron is discovered by saturating the diluted acid with carbonate of soda, and adding prussiate of potassa; if a blue precipitate be formed, it may be concluded that iron is present. A blue color being produced by supersaturating the acid with ammonia detects copper.'

Medical properties.—' This acid is tonic and antiseptic. It has been efficaciously used in typhus fevers, and in some cutaneous eruptions. It is a common and useful adjunct to gargles in the proportion of from f. ʒß. to ʒij. in f. ℥vi. of any fluid in ulcerated sore throats and scarlatina maligna; and in a very highly diluted state, viz. ♏viij. in f. ℥iv. of water, it has been recommended as an injection in gonorrhœa.

This acid has even been regarded as an antidote in general syphilitic affections; but the observations of Mr. Pearson have shown this opinion to be erroneous; yet, by its salutary effects on the stomach and general health, it is a medicine capable of ameliorating the appearance of venereal ulcers, and restraining for a time the progress of the disease, where it is desirable to gain a little time previously to entering on a mercurial course. The dose is from ♏ x. to ♏ xx., in a sufficient quantity of water, or in any bland fluid. It is incompatible in prescriptions with alkalies, most of the earths, oxides, and their carbonates; sulphuret and tartrate of potassa, tartarised antimony and iron, nitrate of silver, and acetate of lead. In typhus, and fevers of a typhoid type, ' I have,' says the author whom we are now quoting, ' generally given it in the infusion of cinchona or cusparia bark. Dr. Paris states that he has found it a preventive of the generation of worms, when given after copious evacuations of the bowels. Largely diluted in any mucilaginous fluid, and sweetened, it is a useful remedy in calculous cases, depending on an excess of the phosphates.

' When muriatic acid is taken as a poison it may be detected by its sensible qualities; but, if mixed with wine or other fluids, let a portion of it be distilled from a small retort over a candle into a phial containing a solution of nitrate of silver. The precipitation of muriate of silver, which is soluble in ammonia, but not in nitric acid, will take place if the poison contain muriatic acid. The best antidotes if exhibited in time are soap and calcined magnesia suspended in water.

' A very important property of muriatic acid in the state of gas is the power it possesses of neutralising putrid miasmata, discovered by Morveau in 1773. It is therefore used as an agent for destroying infection in sick rooms and hospitals disengaged by pouring sulphuric acid on common salt.' Thomson. See the article MEDICINE.

Acidum nitricum. London.—Nitric acid. Take of nitrate of potassa dried, and sulphuric acid, each by weight two pounds; mix them in a glass retort, and distil the nitric acid from a sand bath until red vapors are produced. Then, having added an ounce of dry nitrate of potassa, redistil the acid in a similar manner.

The specific gravity of this acid is 1·500. 100 grains are saturated by 212 grains of crystals of subcarbonate of soda.

Edinburgh.—Take of nitrous acid any quantity, put it into a retort; and, having fitted a receiver which must be kept cold, apply a very gentle heat, until the reddest part shall have passed over, and the acid which remains in the retort, already almost free from color, have become nitric acid.

Acidum nitrosum. Edinburgh.—Nitrous acid. Take of nitrate of potassa bruised two pounds, sulphuric acid sixteen ounces. Pour the acid upon the nitrate of potassa in a glass retort, and distil from a sand-bath with a gradually increased heat until the iron pot become of an obscurely red heat.

The specific gravity of this acid is 1·520.

These processes do not always ensure the absolute purity of nitric or nitrous acid, inasmuch as the nitrate of potassa itself may not be quite free from contamination; but the medicinal properties of the materials are not affected by these slight impurities.

Qualities.—The nitrous acid of the Edinburgh Pharmacopœia is orange-colored and fuming; it consists of nitrous gas in a state of loose combination with nitric acid and water.

The liquid nitric acid is of an exceedingly pale yellow color, nearly indeed colorless. It is volatilised by heat, and light decomposes it. Its constituents, independent of water which gives it its fluid form, are stated to be 25·93 azote, and 74·07 oxygen, in 100 parts; or one volume of azotic gas and two volumes and a half of oxygen gas. The strongest fluid acid contains twenty-five per cent. of water, and seventy-five of dry acid.

Acidum nitricum dilutum. London.—Diluted nitric acid.

Take of nitric acid a fluid ounce; distilled water nine fluid ounces. Mix.

Acidum nitrosum dilutum. Edinburgh.—Diluted nitrous acid.

Take of nitrous acid and of water equal weights. Mix, avoiding the noxious vapors.

' These processes are intended for the most convenient apportionment of the dose in the exhibition of this acid. In the former editions of the London Pharmacopæia, the proportions of acid and water were equal by weight; but the alteration in the present edition makes a very important difference of strength in a given measure of the diluted acid, prepared after the first and the last of the above formulæ.'

When prepared, according to the directions of the London College f. ℥j contains about grs. 68 of nitric acid, of 1·500 specific gravity, and will saturate 144 grains of crystallised subcarbonate of soda; while the same measure of the same acid, prepared after the Edinburgh and Dublin and the former London formulæ, contains grs. 390·5 of the same acid; a difference which may lead to errors in practice; and is therefore to be regretted, particularly as no reason is assigned for the change.

Medical properties.—Nitric acid is tonic and antiseptic. When very largely diluted with water it forms an agreeable and very useful beverage in fevers, particularly of the typhoid type. In larger doses, less diluted, it has been efficaciously administered in chronic hepatitis, even when dropsy has supervened, and has also been found serviceable in restraining violent sickness in dyspepsia, asthmas, and the majority of the cachexiæ. From some observations of Dr. Scott, published at Bombay, in 1796, this acid excited considerable attention as a remedy for syphilis; but after the most ample trials, by almost every practitioner of any eminence in the country, its antisyphilitic powers have not been found by any means to answer the accounts of them transmitted from India. The subsequent publications of Dr. Scott, however, have shown that he did not employ nitric acid, but a mixture of three parts of muriatic and two of nitric. It checks for a time the progress of the disease, but does not permanently remove the symptoms; and, as Mr. Pearson justly observes 'it would by no means be warrantable to substitute the nitrous (or nitric) acid in the place of mercury for the cure of venereal complaints.' It is, however, in many cases, of much benefit during a mercurial course or prior to its commencement, when the constitution is impaired and inadequate to support the effects of mercury; as by its tonic powers it promotes the general health, and lessens the action of the mercurial remedy on the mouth and fauces; yet when it is pushed too far, it affects the mouth and produces ptyalism. When dropsy supervenes on reiterated courses of mercury, which is not unfrequent in broken-down constitutions, this acid Mr. Carmichael observes, given in as large doses as the stomach will permit conjoined with digitalis, is productive of the utmost benefit. We have found it of considerable service, given at the same time with mercury in old obstinate ulceration of the legs, although no venereal taint could be suspected; and it is employed with benefit as a local stimulant in the form of lotion, in the proportion of f. ʒij of the diluted acid to Oj of water, to fetid ulcers attended with a thin ichorous discharge, and in caries of the bones. In India, and in this country for some years past, nitric acid has been used combined with muriatic in the form of a bath (see MEDICINE), and in this state produces a slight excitement of the skin, a peculiar taste in the mouth, and in other respects merely the same effects as when it is taken internally; but the chief perceptible effect of the mixed acid is on the bowels, which it keeps moderately open. Diluted nitric acid has often been employed as a poison. It is detected by the orange colored spots which are observed on the lips, chin, and hands of the patient; and, if death be the result, by the same color being found in a large portion of the alimentary canal, the mucous membrane of which is converted into a fatty substance, and the stomach often perforated. If any of the fluid can be obtained, the extrication of orange colored fumes on boiling it over copper filings is a certain test of aqua-fortis. Soap and calcined magnesia suspended in water are the best antidotes.

The dose of the diluted acid is from ♏x. to ♏xxx. in f. ℥iij. of water, given three or four times a day. When used as a bath, the mixed acid should be added to the water, until it is about as sour as weak vinegar.—Nitric acid, even when diluted, is incompatible in prescriptions with oxides, earths, alkalies, the sulphurets and the acetates of potassa, and of lead. It decomposes the two last named salts, and forms nitrates of lead and potass. We have thus been copious in our accounts of the acids—of the muriatic and nitric,—and have extracted largely from Dr. Thomson, for the reasons intimated above in respect to the first; and because the last (as we have seen) has been proposed, and extensively and mistakenly, but at the same time usefully, administered, as a counteractive of the syphilitic poison, and of the constitutional affections which that poison at different times engenders.

Acidum succinicum. Edinburgh.—Succinic acid.

Take of powdered amber and pure sand, each of equal parts; mix them together and put them into a glass retort, of which they may fill one half. Having adapted a large receiver, distil from a sand-bath with a gradually increased heat. A watery liquor with a little yellow oil will first come over, then a yellow oil and an acid salt; and lastly, a reddish and black oil. Pour the liquor out of the receiver, and let the oil be separated from the water. Press the acid salt collected in the neck of the retort and on the sides of the receiver between folds of bibulous paper, that it may be freed from the adhering oil; then purify it by solution in hot water and crystallisation.

Sand is ordered to be used in these preparations, to prevent the amber which swells much from passing over into the receiver.

Qualities.—When the crystals of the acid are pure they are white and shining; they have an acid taste, and are highly volatile. They are partly soluble in cold water, but more readily in hot water, and in alcohol. The sulphuric and nitric acids also dissolve them without producing decomposition.

When succinic acid is adulterated with tartaric acid, the adulteration may be detected by carbonate of potass. Nitrate of silver detects muriate of ammonia, and the sulphate of potassa would be found by barytic water.

Medical properties.—Very little use is at present made of this acid in medicine, although it would seem to possess stimulating and probably expectorant virtues.

Acidum sulphuricum dilutum. London.—Diluted sulphuric acid.

Take of sulphuric acid a fluid ounce and a half, distilled water fourteen fluid ounces and a half. Let the acid in mixing be gradually added to the water.

Edinburgh.—Take of sulphuric acid one part, water seven parts; mix them.

Dr. Thomson expresses his regret that when the London College in the last edition of the Pharmacopœia altered the proportion of the acid and water, they did not adopt those of Edinburgh and Dublin, so that there might have been a standard strength for the whole kingdom; at present one fluid ounce of the London contains eighty grains of the strong acid, while in the Edinburgh and Dublin pharmacopœias it constitutes an eighth part.

The heat generated during the mixture of the acid and water is guarded against by the gradual admixture; and the diluted acid being purer than the strong from the circumstance of not being able to hold in solution some sulphates which the latter contains, the Dublin College have very properly ordered the decanting of the clear liquor from the sediment.

Medical Properties.—Tonic, refrigerant, antiseptic, and in some cases astringent. It is a very useful medicine in some chronic disorders of the skin; and in hæmorrhagic affections it is often highly beneficial. Dose from ♏x. to ♏xxx.

Acidum sulphuricum aromaticum. Edinburgh.—Aromatic sulphuric acid.

Take of alcohol two pounds, sulphuric acid six ounces. Drop the acid gradually into the alcohol. Digest the mixture in a covered vessel with a very gentle heat for three days; then add one ounce and a half of bruised cinnamon bark, and one ounce of bruised ginger root. Digest again in a close vessel for six days; then filter through paper placed in a glass funnel.

This seems but little more than a simple solution of ginger and cinnamon in alcohol and sulphuric acid, very little of the ethereal principle being generated from the admixture of the alcohol and acid.

Qualities.—The odor is aromatic, taste a grateful acid, and color rather brown.

Medical properties.—Aromatic as well as tonic, and therefore especially applicable to stomach affections. We should have liked to have seen it adopted by the London College, inasmuch as the sulphuric acid is very often highly serviceable in dyspeptic disorders, and the aromatic additions make it more applicable in these complaints.

Acidum tartaricum. London.—Tartaric acid.

Take of supertartrate of potassa two pounds and a half, distilled water three gallons, prepared chalk one pound, sulphuric acid one pound. Let the supertartrate of potassa be boiled with two gallons of distilled water and the prepared chalk be gradually added until bubbles cease to be produced. Let the mixture be set apart that the tartrate of lime may subside; pour off the fluid and wash repeatedly the tartrate of lime with distilled water until it come off tasteless. Then pour upon the tartrate the sulphuric acid diluted with a gallon of the boiling distilled water, and set the whole apart for twenty-four hours, occasionally stirring it. Filter the liquor and evaporate it in a water-bath to obtain the crystals.

The lime in this preparation separates the tartaric acid from the potassa, and then again yields it up to combine with the sulphuric acid. If a little acetate of lead is dropped into a small portion of the liquor, before it is set aside for crystallising, a precipitate will be produced if any sulphuric acid still remains, and then a little more of the tartrate of lime should be added.

Qualities.—The crystals are white, without smell, and exceedingly acid. It is readily soluble in water. It forms tartrates with alkalies and earths.

Medical properties.—Refrigerant; when added in solution to a solution of carbonate of soda, a good substitute for common soda water is formed.

Appendix to the Acids.

We shall here use the freedom of extracting the whole of what Dr. Thomson has introduced into his valuable Dispensatory under the above title.

'In the following appendix,' says Dr. T., 'I propose to give a short account of two acids, which although they have not a place in any of the British Pharmacopœias, yet are of great importance; the one being a remedy of considerable efficacy in a certain class of diseases, and the other demanding the attention of the medical practitioner from the frequent employment of it as a poison.

1. *Acidum hydrocyanicum.* Hydrocyanic (Prussic) acid.—This acid is found in many vegetable productions, such as the bark of the prunus padus, or bird cherry; the leaves of the peach and nectarine trees, bitter almonds, and the kernels of many fruits; but for the purposes of medicine it is artificially prepared.

Preparation.—The best method of preparing hydrocyanic acid for medicinal use is the following, which was first employed by Scheele.

Mix two ounces of Prussian blue with six ounces of red precipitate of mercury, and add six ounces of water. Boil the mixture for some minutes, constantly agitating it, when the blue liquor will disappear, and the mass assumes a yellowish gray hue. Pour the whole on a filter, and wash the residuum with a little hot water, which is to be added to the filtered liquor. Pour this upon an ounce and a half of clean iron filings, and add three drachms of strong sulphuric acid. Shake this mixture well, and, after the powder subsides, pour the fluid into a retort, and distil one-fourth part of it over into a well luted receiver. This is the hydrocyanic acid containing an admixture of a little sulphuric acid which is readily separated by means of barytic water. La Planche recommends one-sixth only to be distilled over, and this to be rectified by means of a gentle fire over $\frac{1}{10}$ of carbonate of lime, drawing off afterwards three-fourths only of the one-sixth of the whole thus treated, by a second distillation. The acid is obtained of a uniform strength by this method.

In the above process the iron filings and the sulphuric acid, added to the solution obtained from boiling the mixture of Prussian-blue and red precipitate of mercury in water, decompose the water, and the reduced mercury combines with the cyanogen, the base of the acids of the Prussian-blue, and forms a cyanuret of mercury. This new combination is again destroyed by heat, and the cyanogen acting upon the nascent hydrogen of the decomposing water forms hydrocyanic vapors, which are absorbed by the water in the receiver, and constitute the hydrocyanic acid.

Physical and chemical properties.—Hydrocyanic acid prepared in the above described manner is a colorless, transparent liquid, with a peculiar odor not unlike that of bitter almonds. It is at first bland and sweet to the taste, but ultimately impresses a pungent acrimony on the halate. It is very volatile; and owing to this property crystallises if a drop of it fall upon paper. Its specific gravity is 0·996.

It is decomposed by a high temperature and by light, being resolved into carbonic acid, ammonia and carbureted hydrogen gas, which are dissipated, and leave behind a carbonaceous deposit. It should therefore be kept in an opaque stoppered bottle. It is very inflammable, burning with a blue flame, and is soluble both in water and in alcohol. According to Gay Lussac it consists of a peculiar base which he has named cyanogen, acidified by hydrogen. Cyanogen is a compound consisting of two proportionals of carbon and one of nitrogen. But the acid employed in medicine contains one part only of the acid referred to by Gay Lussac, and eight parts and a half of water.

Medical properties and uses. — Hydrocyanic acid when taken into the stomach in large doses acts as an instantaneous and most powerful sedative, destroying completely the nervous energy and the irritability of the body, and consequently extinguishing life; but in an animal thus killed the action of the heart continues for some time after the animal has apparently ceased to live. The observation of this curious fact led professor Bern, in 1809, to administer prussic acid as a remedy in pulmonary inflammation, and he found that it quickly subdued the violence of the disease 'without having any recourse to more than preliminary bleeding.' British practitioners, however, were altogether unacquainted with this remedy until after Dr. Majendie published his first essay on this subject in 1815; when Dr. Granville, through the medium of the London Medical Repository directed their attention to its powers; and I refer those who are desirous of tracing the introduction of prussic acid into use, as a medical agent, to his work (Dr. T. here refers to a Treatise on the Internal use of hydrocyanic acid, second edition, London, 1820).

Prussic acid, internally exhibited, is a remedy of great efficacy in spasmodic coughs of every description, particularly asthma, chronic catarrh, and hooping cough. It has also been employed with success in palpitations of the heart. (London Medical and Physical Journal, November 1823.) In my own practice I have witnessed its powers in that affection of the trachea which is often mistaken for phthisis pulmonalis, and is not less fatal. In true tubercular phthisis my own experience does not enable me to say much in favor of prussic acid; but the mass of evidence brought forward in testimony of its beneficial influence in this disease by Dr. Granville should not be overlooked; and, as I have stated in another place (vide Dr. Granville's Treatise, second edition, p. 376), the judicious exhibition of prussic acid in the early stages of pulmonary consumption, may do much to bring that disease under the control of art. Prussic acid has been found extremely useful in the treatment of those epidemic catarrhs with which this country is occasionally visited; and no remedy is so well adapted as an adjunct to tonics for removing those dyspeptic affections which are attended with acidity of the stomach, and accompanied with heat and soreness of the tongue. In these cases it reduces the morbid irritability of the stomach, and thereby enables the juices of that organ to be more slowly secreted, and of a more healthy character. [Here Dr. Thomson introduces the following note:—Dr. Elliotson has published a small volume containing the result of his practice with prussic acid in dyspepsia, and has stated that accident led him to try the powers of the medicine in this class of diseases. Respect for my own character obliges me to say that nothing could surprise me more than this statement of Dr. Elliotson, as he acknowledges having read the first edition of Dr. Granville's treatise, which contains a letter from me, dated the 20th of February, 1819, stating my sentiments of the utility of prussic acid in dyspepsia, and the modus operandi of the remedy previously to his having employed it.]

Its beneficial effects in asthma and in hooping cough are also well established. M. Haller recommends it in aneurism of the heart and aorta. (Vide Traité de la nécessité de ne point insister sur l'usage interieur des excitans dans l'empoisonnement par l'acide hydrocyanique. Par. H. S. Haller, Paris, 1824.) Cases are also on record in which this acid has proved serviceable in the treatment of painful and difficult menstruation, floodings, hæmoptysis, and nervous diseases. It certainly is a very powerful sedative, and may be employed in all cases in which sedatives and narcotics are indicated with decided advantage.

As a local remedy, prussic acid is the only application which can be depended on for allaying the itching and tingling which are so distressing in impetiginous affections. I have lately employed it with unvarying success in these complaints; and having published my observations (vide Medical and Physical Journal, February 1822), I am in hopes of having its value determined in the hands of others. I have found it useful also in combination with small doses of oxymuriate of mercury in acute rosacea, and several other cutaneous diseases.

The dose of prussic acid is from ♏ij. to ♏viij. It may be administered in distilled water, or in almond emulsion, or in infusion of cinchona bark, as circumstances may require. When an over dose has been taken, its deleterious effects are best counteracted by hot brandy and water, and the ammoniated tincture of iron M. Haller recommends bleeding, ammoniacal frictions, and acidulated drink; but more reliance is to be placed on stimulants. As a local application it may be used in the form of lotion, in the proportion of a fluid drachm to a fluid ounce and a half of distilled or of rose water, or as a cataplasm, composed of crumbs of bread, soaked in a solution of a f. ʒiß of the acid in f. ℥j. of distilled water. It is incompatible in prescriptions with nitrate of silver, the salts of iron, and the mineral acids.

Although the instantaneous power of prussic acid, in destroying animal life, when it is taken in doses sufficiently large to operate as a poison, may perhaps always prevent medical art from proving beneficial in such cases; yet it is of importance to be able to ascertain, in judicial enquiries relative to suicide or to murder, that prussic acid has been administered as a poison. This may be done if the animal be opened from eighteen to forty-eight hours after death. The following means pointed out by Dr. Granville for detecting its presence in the animal system after death should be known:—Collect the blood contained in the ventricles of the heart, a portion of the contents of the stomach, and any fluid that may be found in the head, the chest, or the abdomen; agitate the mixture for some time with distilled water, and filter the liquid, taking care to preserve the whole at a low temperature. To a small quantity of the filtered liquid add a few drops of a solution of pure potassa in alcohol; then add a few drops of a solution of sulphate of iron, and if a reddish precipitate of the color of burnt terra siena now fall down, which, on the addition of a little sulphuric acid, changes to a bluish-green, and gradually on exposure to the atmosphere becomes a beautiful blue, we may conclude that the death of the individual has been occasioned by prussic acid. The stomach is first to be examined entire, to ascertain whether the odor of that acid is perceptible in it; after which it is to be cut in pieces under distilled water, and a portion of it distilled with an equivalent portion of the water until one-eighth of the liquid has passed into the receiver. That liquid is to be rendered slightly alkaline with potassa; then a few drops of a solution of sulphate of copper is to be added to a small portion of it, and afterwards a sufficient quantity of muriatic acid to redissolve the excess of the oxide of copper. The liquid will appear more or less milky according to the quantity of hydrocyanic acid present. This test will detect $\frac{1}{30000}$ of hydrocyanic acid in solution in water.

[In addition to the statement of the medical virtues possessed by this acid as above made by Dr. Thomson, we may add that it will in some cases of pain from a carious tooth be found exceedingly useful. In its application care must be taken to convey a drop or two of the acid or a less limited quantity of the solution recommended by Dr. T. into the hollow of the tooth, and its good effects will sometimes prove instantaneous.]

2. *Acidum oxalicum.*—Oxalic acid.

Oxalic acid exists ready formed in many vegetable and some animal bodies. Combined with potassa it is found in the leaves of the oxalis acetosella, and corniculata, rumex acetosa, and geranium acidum, and with lime in the roots of rhubarb, valerian, and many other plants. Berthollet procured it from honey, hair, tendons, albumen, and some other plants; but that which is found in the shops manufactured for the purposes of art is produced artificially by the action of nitric acid on sugar. The following process, which was first described by Bergman, is still adopted for the production of oxalic acid.

Into a tubulated retort put one ounce of white sugar, pour over it three ounces of strong nitric acid of specific gravity 1·567. When the whole is dissolved boil the liquor until it ceases to afford nitrous fumes and acquires a reddish brown color; then add three ounces more of nitric acid, and continue the boiling until the fumes cease, and the color of the fluid disappear. Empty the contents of the retort into a wide vessel, and upon cooling a crystallisation will take place, which is oxalic acid. On boiling the lixivium with two ounces of nitric acid in the retort until the red fumes almost disappear, a second supply of crystals will be obtained. 100 grains of sugar, when properly treated, yield fifty-eight grains of crystallised oxalic acid. The rationale of the process is very obvious, the nitric acid is partially decomposed, and yields up a portion of oxygen which is one of its components to the sugar, which is a compound of oxygen, carbon, and hydrogen, and by this addition of oxygen is converted into oxalic acid. The relative proportions of these components of sugar is oxygen 49·4, carbon 44·5, and hydrogen 6·1, in 100 parts; that of oxalic acid, oxygen 64, carbon 32, and hydrogen 4, in 100 parts.

Qualities.—The crystals of oxalic acid when they are properly prepared are four sided prisms with the sides alternately larger, terminated at their extremities by dihedral prisms. They are white, transparent, inodorous, have a very acid sour taste, and redden all the vegetable blues except indigo. One grain of oxalic acid communicates a sensible acidity to 2633 grains of water. The crystals dissolve in twice their weight of water at 65°, and in their own weight of boiling water. Alcohol at a mean temperature dissolves forty parts of them, and boiling alcohol fifty-six parts. They are sparingly soluble in ether. The crystals are in a state of a hydrate, 100 grains containing fifty-two only of acid, and forty-eight of water.

Oxalic acid combines with alkalies, earths, and metallic oxides, forming oxalates. Muriatic and acetic acids dissolve it without alteration; but it is decomposed both by sulphuric and nitric acids aided by heat.

Medical properties and uses.—Oxalic acid in small doses, when it is dissolved in a large quantity of water sweetened with sugar, forms an agreeable cooling beverage, which may be used in febrile diseases in the same manner, and with the same intention, as lemonade. It may also be employed to check an external hæmorrhagy, which it appears to do by charring the blood as it issues from the wound, and thereby mechanically stopping its flow. It is a virulent poison when swallowed in large doses, and, from the resemblance of its crystals to those of sulphate of magnesia, many fatal accidents have occurred for mistaking oxalic acid for that purgative salt. The acid taste of the one salt and the bitter taste of the other would always prevent such accidents, were individuals to taste their medicines before swallowing them; but, besides the occurrence of accidents, oxalic acid has of late been too frequently employed by the wretched suicide for the purpose of self-destruction. It is, therefore, important that every medical practitioner should be acquainted with the qualities of oxalic acid, its effects on the animal economy, and the means of counteracting these when it has been taken in a sufficient dose to operate as a poison.

The exact extent of oxalic acid which may be taken with impunity has not been determined; but its poisonous properties are more or less virulent according to the degree of dilution of the dose. From some experiments on animals which I made ten years since, and the published details of the appearances in dissection of several fatal cases of poisoning by oxalic acid, I was led to form an opinion that 'the primary morbid action of this poison is on the stomach itself, on the coats of which its chemical action occasions the organised animal solid to enter into new combinations, and thence produces a decomposition, both of the acid and the part to which it is applied;' that the acid, however, also enters into the circulation by absorption; but, 'that the proximate cause of death by oxalic acid is the suspension of the functions of the heart and brain, which are sympathetically affected by the local injury done to the stomach.' (London Medical Repository, vol. iii. p. 386.) The subject has since been investigated with much care and great ingenuity by Dr. Christison and Dr. Coindet, and their observations published in the Edinburgh Medical Journal, vol. xix. p. 163. From the labors of these gentlemen I am induced to change my opinion as to the extent of the injury done to the living stomach, and to believe that the pultaceous state of that organ which was found by me in my experiments on dogs, is to be attributed to the action of the acid on its coats after death. I am, however, still of opinion, that death is less to be attributed to the sedative power of the poison acting on the brain and spine, to which it is carried by absorption, than to the sympathetic action on the nervous system from the local injury of the stomach, an opinion according with their first conclusions, that 'oxalic acid when introduced into the stomach in large doses and highly concentrated irritates it, or corrodes it, by dissolving the gelatine of its coats; and death takes place by a sympathetic injury of the nervous system.'

The general symptoms attending poison by oxalic acid are, burning pain in the stomach; violent and incessant vomiting, the matter ejected being commonly dark colored, and sometimes bloody; in some cases there have been violent gripings and purgings; the pulse soon sinks and becomes almost imperceptible, and this state is followed by deadly coldness of the limbs, attended with lividity of the fingers, and nails, and clammy sweats; convulsions, but not in every instance, and insensibility, precede death. With regard to appearances after death, no particular change in the external state of the body has been noticed. On opening the body, the stomach is found generally to contain a quantity of dark colored fluid, which is probably extravasated blood charred by the poison; in some instances the coats of the stomach have been found greatly injured, presenting appearances of great vascularity, thickening of the mucous coat, the rugæ pultaceous and easily wiped off, and in some cases the other membranes have been found tender and even perforated, so that the contents of the organ have escaped into the cavity of the abdomen. The lungs and heart have not been often examined; but, in the lower animals killed by oxalic acid, both have presented indications of inflammation having existed in them, particularly the lungs. The vessels of the brain have been found turgid.

The fatal effects of poisoning by oxalic acid are so rapid that little opportunity is afforded of counteracting them by medical art. The first object certainly, in every case, is to evacuate the poison from the stomach, and when the stomach pump is at hand it should be instantly employed. The vomiting which usually supervenes precludes the necessity of employing emetics; and copious dilution, which in other cases of corrosive poison is advisable, is more likely to promote the absorption of the acid, and consequently increase its powers. Before, therefore, emetics are employed, if they should be deemed necessary, the activity of the poison should be weakened by altering its nature by some substance with which, in chemically combining, its solubility is diminished. That chalk produces this effect I discovered in making the experiments already alluded to, and several instances have since occurred in which its administration has saved the lives of individuals poisoned by oxalic acid. The lime of the chalk unites with the oxalic acid, and forms an oxalite which is perfectly inert. Magnesia may be employed instead of chalk, and it has the advantage of not inconveniencing the patient by the extrication of carbonic acid gas, which is copiously evolved when the chalk unites with the acid; but as the oxalate of lime is more insoluble than the oxalate of magnesia, and consequently more inert, it may be questioned whether the inconveniences of the gas may be equivalent to the greater security from the employment of chalk. A mixture of chalk and water, or of magnesia and water, should therefore be instantly given when oxalic acid has been taken in a large dose; and, after the local effects of the poison have been counteracted, the system should be supported by cordials combined with opium, and the oxalate afterwards be carried out of the system by the aid of purgatives.

To obtain legal evidence in cases of poisoning by oxalic acid when none of the poison is found, we may be guided to suspect the nature of the poison by the symptoms and the post mortem appearances; but a correct opinion can be formed only by an analysis of the vomited matter, the contents of the stomach and its coats. For this purpose, the vomited matter and the contents of the stomach should be separately diluted with distilled water, and the coats of the organ itself boiled in distilled water. These solutions should then be separately filtered and decolorised with chlorine, and subjected to the following tests. If oxalic acid be present, hydrochlorate (muriate) of lime will occasion a precipitate which is soluble in a small quantity of nitric acid, but not in muriatic, unless a very large quantity of the acid be used. Sulphate of copper throws down a bluish-white precipitate in any fluid containing free oxalic acid, which is insoluble in hydrochloric acid; and nitrate of silver occasions a heavy white precipitate, which, when dried and heated over the flame of a candle on the point of a spatula, becomes brown at the edge, then suddenly fulminates, and is all dissipated in white fumes. This is a very delicate test; for Dr. Christison informs us that, from a quarter of a grain of oxalic acid dissolved in 4000 parts of water, he and Dr. Coindet procured enough of the oxalate of silver to show its fulmination twice. (Edinburgh Medical Journal, vol. xix. p. 198.)

Alkalies and Salts.

Under the word Alkali, and in the article Chemistry, will be found definitions of alkalies and statements of those recent discoveries, more especially of Sir H. Davy, which have thrown new light on their composition. We may here repeat that the general properties of these bodies are those of combining with acids forming neutral salts in which the qualities of both the components are lost, of changing the blue colors of vegetables to green, and of combining with oil into a soapy matter which thus occasions, to a certain extent, the union of oil and water. Alkalies also have an acrid urinous taste; are exceedingly caustic, so much so as to corrode or dissolve animal matter; they have a great affinity for water, which, in some cases, they abstract so rapidly and readily even from the atmosphere, that it is necessary to keep them in well-stopped glass bottles, and they are susceptible of fusion or volatilisation by strong heat.

Of the alkalies, the potassa, soda, and ammonia, only are used in pharmacy in an uncombined state.

The London College, adopting the alphabetical order of arrangement, first speak of the preparations of ammonia, then of potassa, and lastly of soda.

Preparations of Ammonia.

Ammoniæ subcarbonas. London, (formerly called ammonia præparata, and sal cornu cervi.)—Subcarbonate of ammonia.

Take of muriate of ammonia a pound, prepared chalk dried, one pound and a half. Let them be powdered separately, then mix them and sublime with a gradually increased heat until the retort become red hot.

Subcarbonas ammoniæ. Edinburgh.—Subcarbonate of ammonia.

Take of muriate of ammonia one part, the softer carbonate of lime, dried, two parts. Let them be separately pulverised, then mixed, and sublimed from a retort into a receiver kept cold.

In this formation a double decomposition takes place. The muriatic acid of the muriate of ammonia is attracted by the lime, and the carbonic acid by the ammonia. The subcarbonate of ammonia which is formed sublimes, while the muriate of lime remains in the retort.

Qualities.—The salt is commonly seen in a white, hard, semi-transparent mass. It is soluble in water, but when warm water is used it is in some measure decomposed. It is not soluble in alcohol. It is decomposed by the acids and alkalies as well as by their subcarbonates. Magnesia also partially decomposes it. The supertartrate of potassa, sulphate of magnesia, the metallic salts, and some of the earths, also decompose this salt. Its specific gravity is 0·966.

Medical properties.—Subcarbonate of ammonia is one of the most useful stimulants which the pharmacopœias afford. It may be administered in several cases, where, in consequence of the inflammatory diathesis which prevails, other excitants would be inadmissible; as in some instances of erysipelatous inflammation, feeble debility, and also in childrens' complaints, part of its virtues being dependent upon its power of neutralising acidity in the first passages. In atonic gout it is an excellent remedy, as it is in some forms of dyspepsia and hysteria. 'One part,' says Dr. Thomson, 'of pulverised subcarbonate of ammonia, and three parts of extract of belladonna spread on leather in the form of a plaster, is an excellent application for allaying rheumatic pains. Dose for internal administration from six grains to fifteen. It may be conveniently rubbed down with a scruple of aromatic confection.

Liquor ammoniæ. London.—Solution of ammonia.

Take of muriate of ammonia eight ounces, lime newly burnt six ounces, water four pints. Pour one pint of the water upon the lime; then cover the vessel and set it aside for an hour. Dissolve the muriate of ammonia in the remainder of the water previously heated; add to it the former mixture, and again cover the vessel: after the liquor has become cold strain it and distil twelve fluid ounces of solution of ammonia into a receiver whose temperature does not exceed 50°. The specific gravity of this solution is 0·960.

Aqua ammoniæ. Edinburgh.—Water of ammonia.

Take of muriate of ammonia one pound, lime newly burnt one pound and a half, distilled water one pound, water nine ounces. Upon the lime broken to pieces pour the water in an iron or earthen vessel, cover it up until the lime has fallen into powder and become cold; then rub the muriate to a fine powder, and triturate it with lime in a mortar, after which put them directly into a bottle glass retort. Place the retort in a sand-bath and adapt to it a receiver furnished with a tube passing into a phial containing the distilled water; the phial, however, being sufficiently large to hold double the quantity of water. Then apply the fire, gradually raising it until the bottom of the iron pot be red hot, and so long as gas and vapor are produced. The specific gravity of this solution is 0·939.

The muriate of ammonia in these processes is decomposed by the lime, this last having a greater affinity for the acid than has the ammonia; the ammonia is consequently disengaged and passes over, and the product is an aqueous solution of it.

Qualities.—Ammonia in this liquid form is a colorless fluid, very pungent in its odor, and having an extremely acid taste. It unites with all the acids and forms with them neutral salts. It soon becomes carbonated by mere exposure to the atmosphere. Acids and metallic salts and alum are incompatible with it in prescriptions. When it is at all carbonated the presence of the carbonic acid may be detected by adding to some of the solution muriate of lime, which will form a precipitate; if indeed it at all effervesce with acids the presence of carbonic acid may be inferred.

Medical properties.—Stimulant, antacid, and rubefacient. Dose from ♏x to ♏xx. If taken as a poison and death does not immediately ensue considerable quantities of vinegar should be poured down the throat.

Aqua ammoniæ diluta. Edinburgh.—Distilled water of ammonia.

Take of water of ammonia one part, distilled water two parts. Mix them.

As extemporaneous dilution is always sufficiently easy, this preparation might have been dispensed with.

Liquor ammoniæ acetatis. London.—Solution of acetate of ammonia.

Take of subcarbonate of ammonia two ounces, diluted acetic acid four pints or a sufficient quantity. Add the acid to the subcarbonate of ammonia until the effervescence cease.

Aqua acetatis ammoniæ. Edinburgh.—Water of acetate of ammonia.

Take of carbonate of ammonia in powder any quantity, pour upon it so much weak acid as will exactly saturate the ammonia.

It is better, perhaps, that the saturation be made by guess and taste, and then tasted as in the Dublin College; for the distilled vinegar is always of varied strength.

Qualities.—This liquor is limpid and nearly without color. Strong acids and fixed alkalies decompose it, as do alum, magnesia, lime water, sulphate of magnesia, oxymuriate of mercury, and nitrate of silver, which are all of course incompatible with it in prescription. The sulphates of metals and acetate of lead are also decomposed by it.

Medical properties.—An exceedingly useful refrigerant and diaphoretic in disorders accompanied by much febrile heat. It is also diuretic, especially when taken while the patient is not in bed. It is useful as a cooling lotion to the head in cases of phrenitic affection, and Dr. Thomson tells us that he has employed it with the best effect, as a lotion in porrigo affecting the scalp. Dose from f. ʒiij to f. ℥j.

Liquor ammoniæ subcarbonatis. London.—Solution of subcarbonate of ammonia.

Take of subcarbonate of ammonia four ounces, distilled water a pint. Dissolve the subcarbonate of ammonia in water, and filter through paper.

Solutio subcarbonatis ammoniæ. Edinburgh.—Solution of subcarbonate of ammonia.

Take of subcarbonate of ammonia one part, distilled water four parts. Dissolve the subcarbonate in the water, and filter through paper.

Qualities.—Limpid and colorless; it forms a coagulum, when shaken with twice its bulk of alcohol.

Medical properties.—Stimulant and diaphoretic. Dose from ♏xxv. to f. ʒj. in any fluid that does not decompose it.

PREPARATIONS OF POTASSA.

Liquor potassæ. London.—Solution of potassa.

Take of subcarbonate of potassa a pound; lime fresh burnt half a pound; boiling distilled water a gallon. Dissolve the subcarbonate of potassa in two pints of the water. Add the remainder of the water to the lime; mix the hot liquors together; then set the mixture aside in a covered vessel; and, when it is cold, let it be strained through a cotton bag. If, on the addition of any diluted acid, effervescence be excited, more lime must be added, and the filtration repeated. A pint of this solution ought to weigh sixteen ounces.

Aqua potassæ. Edinburgh.—Water of potassa.

Take of lime fresh burnt eight ounces; subcarbonate of potassa six ounces; boiling water twenty-eight ounces. Let the lime be put into an iron or earthen vessel with twenty ounces of the water. When the ebullition ceases, immediately add the salt dissolved in the remaining eight ounces of the water; and, having thoroughly mixed the whole, cover the vessel till the mixture cool. The mixture being cooled, agitate it well, and pour it into a glass funnel, the tube of which is obstructed with a piece of clean linen. Cover the upper orifice of the funnel, while its tube is inserted into another glass vessel, that the solution of potassa may gradually drop through the linen of the lower vessel. When it first ceases to drop, pour a few ounces of water into the funnel; but cautiously, so that the fluid may swim above the matter. The water of potassa will again begin to drop. The affusion of water, however, must be repeated until three pounds have filtered, which will be in the space of two or three days; then let the upper part of the solution be mixed with the lower by agitation, and preserve it in a well stopped vessel.

In this separation the lime, attracting the carbonic acid of the subcarbonate of potassa, leaves the alkali in a state of purity, or causticity. The liquid should be kept in closely stopped bottles, otherwise it will become carbonated by exposure to the air.

Qualities.—Solution of potassa is exceedingly caustic, scarcely admitting of being put on the tongue. It is without color, and has an oily appearance when shaken. If muriates be present in it they may be detected by saturating a portion of the liquid with nitric acid, then adding nitrate of barytes to precipitate the sulphates if any; and lastly adding a solution of nitrate of silver, which is precipitated if any muriate be present. Sulphates are detected by saturating the liquor with muriatic acid, and adding muriate of barytes; and if lime be present blowing into a liquor through a tube, by adding carbonic acid, will render it turbid. It is always more or less impure, as ordered by the pharmacopœias, but not to the extent of interfering with its medicinal virtues. The specific gravity of the solution ought to be 1·056. It is a solvent of gum, extractive and resin, and it forms soap when mixed with oils or fat.

Medical properties.—Diuretic, antacid, and lithontriptic. Dr. Willan speaks highly of it in lepra; and Dr. Thomson says that it may be almost regarded as a specific in the various species of psoriasis which depend altogether upon acidity in the primæ viæ, and a hasty and consequently imperfect formation of the juices of the stomach.

Dose ♏x. to f. ʒj. or f. ʒij in some of the cutaneous affections.

Liquor potassæ subcarbonatis. London.—Solution of carbonate of potassa.

Take of subcarbonate of potassa a pound; distilled water twelve fluid ounces. Dissolve the subcarbonate of potassa in the water, and filter the solution through paper.

Qualities.—This solution ought to be quite clear, and without color or smell. It is of course incompatible in prescription with sulphate of magnesia and the metallic salts. It is likewise improper to mix with lime water, or magnesia, or substances containing much of the tannin principle.

Medical properties.—The same as the salt itself. Dose from ♏xv. to f. ʒij.

Potassa cum calce. London.—Potassa with lime. Take of solution of potassa three pints; lime fresh burnt a pound. Boil the solution of potassa down to a pint; then add the lime, previously slaked by the water, and intimately mix them.

Potassa cum calce. Olim, *Causticum commune mitius.* Edinburgh.—Potassa with lime; formerly, milder common caustic.

Take of the water of potassa any quantity. Evaporate it to one-third part in a covered iron vessel; then mix with it as much newly slaked lime as will bring it to the consistence of a solid paste, which is to be preserved in a well stopped vessel. The lime makes the alkali less deliquescent, and consequently more manageable as an escharotic.

Potassa fusa. London.—Fused potassa.

Take of solution of potassa a gallon. Evaporate the water in a clean iron vessel over the fire until, the ebullition having ceased, the potassa melts; then pour it out upon a clean iron plate into pieces of proper form.

Potassa. Olim. *Causticum commune acerrimum.* Edinburgh.—Potassa; formerly stronger common caustic.

Take of solution of potassa any quantity. Evaporate it in a covered very clean iron vessel until, the ebullition being over, the saline matter flows smoothly like oil, which happens before the vessel becomes red hot. Then pour it out upon a clean iron plate, cut it into small masses before it hardens, and let it be preserved in well stopped phials.

'The concrete potassa procured by these processes is a hydrate sufficiently pure for medical purposes; but it still contains the same foreign ingredients as the solution. To procure it as free as possible from carbonic acid, the evaporation should be performed in a silver vessel very quickly; the vessel should be deep, so that the watery vapor which arises may exclude the atmospheric air. It is generally run into moulds, and formed into solid cylinders, which are covered with paper, and kept in well stopped bottles. The method of Berthollet for obtaining it in perfect purity, which is usually described in chemical and pharmaceutical works, is too troublesome and expensive to be generally adopted. The following method, proposed by Lowitz, is more economical:—

A solution of potassa must be evaporated till a pellicle forms on its surface, then allowed to cool; and the saline deposit, which consists chiefly of the foreign salts, carefully separated. The evaporation is then to be renewed, skimming off the pellicles that form on the surface of the fluid, which, as soon as these cease to be produced, and the ebullition is ended, must be removed from the fire, and constantly stirred till it is cold. The mass is next to be dissolved in twice its weight of distilled cold water, the solution filtered and evaporated in a clean iron or silver basin until crystals are deposited. If the heated fluid consolidate into a mass in any degree, a small portion of water must be added, and the mass again heated to fluidity. The supernatant liquor is left of a brown color, which, after being kept for some time at rest in well-stopped phials, deposits the coloring matter, and may again be evaporated and crystallised as before. The crystals obtained in the various evaporations are colorless, pure potassa.'—Thomson.

Qualities.—When made properly, potassa is in the form of a white brittle substance, smelling like quicklime when being slaked, and too caustic to be tasted. It is soluble in water and alcohol, and attracts humidity from the air. It is fused and volatilised by heat; and it combines with sulphur, the fixed oils, and the metallic oxides.

Medical properties.—Escharotic. Employed usefully in strictures requiring caustic.

Potassæ acetas. London.—Acetate of potassa.

Take of subcarbonate of potassa a pound and a half; of the stronger acetic acid two pints; boiling distilled water two pints. Mix the acid with the water, and pour it upon the subcarbonate of potassa till all ebullition cease, after which filter. First evaporate the solution in a water-bath until no more bubbles rise; then expose it to gradually increased heat, and continue the evaporation till a pellicle form, which should be removed and dried on blotting paper. Repeat the evaporation again and again, removing the pellicles as they form, and drying them in the manner already described.

Acetas potassæ. Edinburgh.—Acetate of potassa.

Take of very pure carbonate of potassa one pound; weak acetic acid a sufficient quantity. Boil the subcarbonate in five pounds of the acid, and add more acid at different times, until, the watery part of the former portion being nearly dissipated by evaporation, the acid newly added occasions no effervescence, which will be the case when about twenty pounds of it have been consumed; then evaporate slowly to dryness. Liquefy this impure salt with a gentle heat for a short time; then dissolve it in water, and filter through paper. If the liquefaction have been properly performed, the filtered fluid will be limpid, but otherwise of a brown color. Afterwards evaporate this fluid in a shallow glass vessel, so that, when removed from the fire, it may pass into a crystalline mass. Finally, the acetate of potassa ought to be preserved in closely shut vessels.

Qualities.—This salt possesses a peculiar odor and a sharp taste. It is deliquescent, and it changes into a subcarbonate by exposure to a red heat. It is soluble in water and alcohol.

When adulterated with tartrate of potassa a precipitate will be occasioned by the addition of tartaric acid in solution; and acetate of lead will produce a precipitate soluble in acetic acid, sulphates may be diluted by nitrate of barytes, and muriates by nitrate of silver.

Medical properties.—Aperient and diuretic. Principally employed in dropsical affections. Dose as an aperient two or three drachms—as a diuretic, from half a drachm to a drachm often repeated.

Potassæ carbonas. London.—Carbonate of potassa.

Take of the solution of subcarbonate of potassa a gallon. By means of a proper apparatus transmit carbonic acid through the solution until it is saturated. Then filter. Evaporate until crystals form, being careful not to increase the heat above 120°, separate the crystals from the fluid and dry them on blotting paper.

Carbonic acid is easily obtained from white marble and diluted sulphuric acid.

Carbonas potassæ. Edinburgh.—Carbonate of potassa.

Take of pure carbonate of potassa two parts, water three parts. Dissolve the salt in the water, and by means of a proper apparatus throw into it a stream of carbonic acid gas. Filter the solution when it ceases to absorb the acid, and then evaporate it by a heat not exceeding 180°, that crystals may form.

The carbonic acid is easily obtained by pouring diluted sulphuric acid on pulverised carbonate of lime.

It has been recommended by some that muriatic acid be used to evolve the carbonic acid from the marble.

Qualities.—'This salt, prepared by these formulæ, is, properly speaking, a bicarbonate; the subcarbonate of the pharmacopœias being really a carbonate.' It is without odor, has a taste slightly alkalescent, and mild. It is not soluble in alcohol. It is incompatible in prescriptions with the acidulous salts, with the metallic salts, with borax, muriate of ammonia, lime water, sulphate of magnesia, and alum.

Medical properties.—Useful in the preparation of the effervescing draught. Dose of the salt from ℈ß to ʒj.

Potassæ subcarbonas. London.—Subcarbonate of potassa.

Take of impure potassa (pearl ashes), reduced to a powder, three pounds, boiling water three pints and a half. Dissolve the potassa in the water and filter; then pour the solution into a clean iron pot and evaporate with a gentle heat until the liquor thicken; lastly, being taken from the fire, stir assiduously with an iron spatula until the salt concrete in small grains.

A purer subcarbonate of potassa may be prepared in a similar manner from tartar, previously burnt until it be of an ash color.

Subcarbonas potassæ. Edinburgh.—Subcarbonate of potassa.

Let impure carbonate of potassa be put into a crucible and exposed to a red heat. Then triturate it with an equal weight of water. Pour the solution after the impurities have subsided into a clean iron pot, and boil it to dryness; stirring the salt constantly towards the end of the boiling, to prevent it from adhering to the vessel.

This salt, as above intimated, is rather a carbonate than a subcarbonate, 'being composed of one atom of each of its components.' See CHEMISTRY.

Subcarbonas potassæ purissimus. Edinburgh.—Pure subcarbonate of potassa.

Take of impure supertartrate of potassa any quantity, wrap it up in moist bibulous paper, or put it into a crucible; and, having placed it among live coals, let it be burnt to a black mass; which, after having reduced it to powder, expose in an open crucible to a moderate fire, until it become white, or at least ash-colored, taking care that it be not melted. Then dissolve it in warm water; strain the solution through a linen cloth, and evaporate it in a clean iron vessel, stirring constantly towards the end of the process with an iron spoon, lest any of it should adhere to the bottom of the vessel. A very white salt will remain, which is to be left a little longer on the fire till the bottom of the vessel become red hot. Finally, when it is cold let it be preserved in well-stopped glass vessels.

Qualities.—The same as those obtained from the potassa of commerce, with fewer impurities. The impurities of this salt we are directed to ascertain in the following manner:—'If one part of it be dissolved in eight parts of distilled water, and saturated with pure nitric acid, the presence of siliceous earth will be indicated by the solution becoming turbid, and, by weighing the precipitate, its quantity may be ascertained. A precipitate being formed on the addition of muriate of barytes indicates the presence of the sulphates; a white precipitate turning bluish on exposure to the light, on adding nitrate of silver, proves the presence of muriatic salts; and calcareous earth is rendered evident by dropping into a solution of the subcarbonate a few drops of a solution of oxalic acid or oxalate of ammonia.'

Medical properties.—Antacid and diuretic; principally employed in the composition of the saline draught, in the proportion of a scruple to a table spoonful of lemon juice, or fifteen grains of the concrete tartaric acid.

Potassæ sulphas. London.—Sulphate of potassa.

Take of the salt which remains after the distillation of the nitric acid two pounds, boiling water two gallons. Mix them so as to dissolve the salt, and then add as much subcarbonate of potassa as may be sufficient to saturate the acid. Next boil till a pellicle be formed on the surface, and after filtering the liquor set it aside to crystallise. Pour off the water, and dry the crystals on bibulous paper.

Sulphas potassæ. Edinburgh.—Sulphate of potassa.

Dissolve the acidulous salt which remains after the distillation of the nitrous acid in hot water, and add so much carbonate of lime in powder as will saturate the superfluous acid, and leave the whole at rest until the fæces subside. Having poured off the fluid filter it through paper, and evaporate until crystals form.

Dr. Thomson prefers the Edinburgh process as being quite equal to the others with less expense.

Qualities.—The taste is nauseous and rather bitter. The crystals decrepitate when heated, but they are not efflorescent. They are soluble to a certain extent in water. The nitric, muriatic, and tartaric acids partially decompose it: its solution is also incompatible in prescription with muriate of barytes, muriate of lime, oxymuriate of mercury, nitrate of silver, and acetate of lead.

Medical properties.—Cathartic and deobstruent. It is often combined with rhubarb and given in the form of powder, on account of its being less soluble and deliquescent than some other of the saline purgatives. Some practitioners, as Dr. Yeats, have much lauded it in complaints of children. Dr. Y. recommends it to be very finely powdered. Dose for an adult from 15 grs. to ʒj.

Potassæ supersulphas. London.—Supersulphate of potassa.

Take of the salt which remains after the distillation of the nitric acid two pounds, boiling water four pints. Mix them so that the salt may be dissolved, and filter. Then let the solution be boiled till one half is evaporated, and let it be set aside to crystallise. Pour off the water, and let the crystals be dried on bibulous paper.

Qualities.—The crystals are acid and bitterish, soluble in water, and reducible to simple sulphate of potassa by exposure to a red heat.

Medical properties.—It has been introduced into the pharmacopœia from an idea that it will afford a useful means of producing the sulphuric acid in combination with an aperient salt. Dose 10 grs. to ʒij.

Sulphas potassæ cum sulphure. Edinburgh.—Sulphate of potassa with sulphur.

Take of nitrate of potassa in powder, and of sublimed sulphur equal weights. Mix them well together, and throw the mixture in small quantities at a time into a red hot crucible. The deflagration being finished, let the salt cool, and preserve it in a well-stopped glass vessel.

This preparation was originally known under the name of sal polychrest. In the process of making it both sulphuric and sulphurous acids are formed from the sulphur, but the oxygen which is evolved by the heat is not sufficient to acidify all the sulphur employed, so that part of the latter goes into combination with the potassa of the nitre as sulphur. Thus, sulphate and supersulphate of potassa are formed together with a sulphuret of the same.

Qualities.—The salt tastes acid, and reddens an infusion of litmus. It is soluble in water, and by exposure to air converted into sulphate of potassa.

Medical properties.—Cathartic, like the sulphate of potassa, by which last it is almost superseded.

Potassæ tartras. London.—Tartrate of potassa.

Take of subcarbonate of potassa sixteen ounces, supertartrate of potassa three pounds, boiling water a gallon. Dissolve the subcarbonate of potassa in the water, and add the supertartrate of potassa reduced to powder, till the effervescence cease. Filter the solution through paper; then boil it until a pellicle appear on the surface, and set it aside to crystallise. The water being poured off from the crystals let them be dried on bibulous paper.

Tartras potassæ. Edinburgh.—Tartrate of potassa:

Take of subcarbonate of potassa one part, supertartrate of potassa three parts, or a sufficient quantity, boiling water fifteen parts. To the subcarbonate dissolved in the water add in small portions the supertartrate of potassa reduced to fine powder so long as it excites effervescence, which gradually ceases before three times the weight of the subcarbonate of potassa be added. Let the solution when it is cool be filtered, evaporated, and set aside to form crystals.

Qualities.—This salt is bitterish to the taste; it is soluble in water, and deliquescent. The weaker acids partially decompose it; and lime water, magnesia, muriate of barytes, nitrate of silver, and acetate of lead completely.

Medical properties.—A useful purgative, operating without griping. Dose from f. ʒij. to f. ℥

Aqua supercarbonatis potassæ. Edinburgh.—Water of supercarbonate of potassa.

Take of water ten pounds, pure subcarbonate of potassa one ounce. Dissolve and expose the solution to a current of carbonic acid gas, arising from carbonate of lime in powder three ounces, sulphuric acid three ounces, and water three pounds, gradually and cautiously mixed. The chemical apparatus of Dr. Nooth is well suited for this preparation. But, if a large quantity of the solution be wanted, an apparatus which will admit of a sufficiently great pressure should be employed. The solution must be preserved in well stopped vessels.

Qualities.—Taste pungent and acidulous, violently effervescing with all acids.

Medical properties.—Antacid, diuretic, and lithontriptic. It is better for the saline draught in effervescence, than that prepared with the carbonate. Dose in calculous disorders f. ℥viij. two or three times a day.

Preparations of Soda.

Sodæ carbonas. London.—Carbonate of soda.

Take of subcarbonate of soda a pound, distilled water three pints. Dissolve the subcarbonate of soda in the distilled water. Then let carbonic acid be transmitted through the solution by means of a proper apparatus until it be saturated, and set it apart to crystallise. Dry the crystals by compressing them in blotting paper. Let the remainder of the solution be evaporated by a heat not exceeding 120°, in order that more crystals may be procured. These are to be compressed and dried in the same manner as before.

Carbonas sodæ. Edinburgh.—Carbonate of soda.

Take of subcarbonate of soda two parts, water three parts. Dissolve the salt in the water and subject it to a stream of carbonic acid gas, until the acid be no longer absorbed. Then let the fluid be filtered and evaporated in a heat not exceeding 18°, so that crystals may form. The carbonic acid is easily obtained from equal weights of pulverised carbonate of lime and of sulphuric acid largely diluted with water.

This is a bicarbonate. Dose from 15 grs. to ℈ij.

Phosphas sodæ. Edinburgh.—Phosphate of soda.

Take of bones burnt to whiteness and reduced to powder ten pounds, sulphuric acid six pounds, subcarbonate of soda a sufficient quantity. Let the powdered bones be mixed with the sulphuric acid in an earthen vessel; then add nine pounds of water, and mix again; keep the vessel in a vapor bath for three days; after which dilute the matter with nine pounds more of boiling water, and strain through a strong linen cloth, pouring boiling water gradually over it until the whole of the phosphoric acid be washed out. Set the strained liquor apart that the impurities may subside, from which pour it off, and evaporate to nine pounds. To this liquor, separated from its impurities and heated in an earthen vessel, add a warm solution of subcarbonate of soda until the effervescence cease. Then strain, and set the liquor aside for the formation of crystals. These being removed add to the liquor, if necessary, a little subcarbonate of soda, that the phosphoric acid may be accurately saturated; and dispose it by evaporation again to yield crystals so long as these shall be produced. Finally let the crystals be kept in a well closed vessel.

Qualities.—This salt resembles in taste the common culinary salt. It effloresces on exposure to the air, is soluble, and undergoes the watery effusion when exposed to a sufficient heat. Muriate of lime, barytes, and magnesia, decompose it, and the strong acids convert it into a biphosphate.

Medical properties.—A mild and gentle cathartic. Dose from ʒvj. to ℥iß.

Sodæ subcarbonas. London.—Subcarbonate of soda.

Take of impure soda (barilla) in powder a pound, boiling distilled water four pints. Boil the soda in the water for half an hour, and filter the solution. Evaporate it to two pints and set it apart that crystals may form. Throw away the remaining liquor.

Subcarbonas sodæ. Edinburgh.—Subcarbonate of soda.

Take of impure carbonate of soda any quantity. Bruise it, and then boil it in water until all the saline matter be dissolved. Filter the solution through paper, and evaporate it in an iron vessel, so that when cold crystals may form.

Qualities.—Taste mildly alkalescent. It is soluble in water, and fusible at 150° of Fahrenheit. For detecting impurities use the methods described under subcarbonate of potassa. If tartaric acid be added to the solution of the subcarbonate of soda, and potassa be present, this matter will form a precipitate of supertartrate.

Medical properties.—Antacid, lithontriptic, and deobstruent. Dose from ℈ß. to ʒj.

Sodæ subcarbonas exsiccata. London.—Dried subcarbonate of soda.

Take of subcarbonate of soda a pound, expose it to a boiling heat in a clean iron vessel until it become perfectly dry, and stir it at the same time diligently with an iron spatula. Lastly rub it into a powder.

Medical properties.—The same as the subcarbonate but stronger, being deprived of the water of crystallisation; on this account also it is much fitter to form into pills.

Sodæ sulphas. London.—Sulphate of soda.

Take of the salt which remains after the distillation of muriatic acid two pounds, boiling water two pints and a half. Dissolve the salt in the water; then gradually add so much carbonate of soda as will saturate the acid. Boil the solution until a pellicle appear; and, after having filtered it, set it apart to crystallise. Pour the water off from the crystals, and dry them on bibulous paper.

Sulphas sodæ. Edinburgh.—Sulphate of soda.

Dissolve in water the acidulous salt which remains after the distillation of muriatic acid; and having mixed chalk with it in powder, to remove the superfluous acid, set it apart until the subsidence of the impurities. Then, having poured off the liquor, filter it through paper, and reduce it by evaporation, so as to form crystals.

Qualities.—This salt is bitter as well as saline to the taste. It is soluble in water, and effloresces when exposed to the air. It also undergoes watery fusion when exposed to a sufficient heat.

Medical properties.—Purgative. Not so much used as formerly, on account of its bitter taste. Dose from ℥j to ℥ij.

Aqua supercarbonatis sodæ. Edinburgh.—Water of supercarbonate of soda.

Take of water ten pounds, subcarbonate of soda two ounces. Dissolve and subject the solution to a stream of carbonic acid gas, procured from three ounces of carbonate of lime, and the same quantity of sulphuric acid, with three pounds of water, gradually and cautiously mixed together. It may be prepared conveniently in Nooth's apparatus. But, if a large quantity of it be required, an apparatus will be requisite that is capable of affording a greater pressure. The fluid must be preserved in well corked bottles.

Soda tartarizata. London.—Tartarised soda.

Take of subcarbonate of soda twenty ounces, supertartrate of potassa powdered two pounds, boiling water ten pints. Dissolve the subcarbonate of soda in the water, and add gradually the supertartrate of potassa. Filter the solution through paper, then boil it till a pellicle forms on the surface, and set it aside to crystallise. Pour the water away from the crystals, and dry them on bibulous paper.

Tartras sodæ et potassæ. Edinburgh.—Tartrate of soda and potassa.

Take of subcarbonate of soda one part, supertartrate of potassa three parts, or a sufficient quantity, boiling water fifteen parts. To the subcarbonate, dissolved in the water gradually, add the supertartrate rubbed to a fine powder, so long as effervescence may be excited, which generally occurs before three times the weight of the subcarbonate is added; when the fluid is cold filter it through paper, and after a proper degree of evaporation set it aside that crystals may form.

This is a triple salt, formed by the saturation of the superabundant acid of the supertartrate by the soda of the subcarbonate, the dissipation of the carbonic acid from the latter, and the union of the two alkaline bases.

K 2

Qualities.—Saline and bitter. Soluble, and slightly effervescent. It is decomposed by a nigh heat and strong acids, and muriates of lime and barytes.

Medical properties.—A mild cathartic, and slightly diuretic. Dose ʒvj. to ℥iß.

EARTHS AND EARTHY SALTS.

The earths are, as it has been stated in the article CHEMISTRY, metallic oxides: some of them being alkalescent, and some not. Of the former, lime, magnesia, and barytes, are those employed medicinally, the last indeed only in combination. Of the earths that do not possess alkaline properties one only is introduced into medicine, viz. alumina, and this, like barytes, is only used when combined; for alum itself is a sulphate. See CHEMISTRY.

PREPARATIONS OF ALUMINA.

Alumen exsiccatum. London.—Dried alum.

Melt the alum in an earthen vessel over the fire, and let the heat be increased till the ebullition ceases.

Edinburgh.—Melt the alum in an earthen or iron vessel, and keep it over the fire until the boiling ceases: then let it be rubbed into a powder.

In this process the water of crystallisation is expelled, and the aluminous principle of course more concentrated; but if the heat be too great, or not sufficiently gradual, its sulphuric acid is partly expelled and decomposed.

Liquor aluminis compositus. London.—Compound solution of alum.

Take of alum and sulphate of zinc each half an ounce, boiling water two pints. Let the alum and the sulphate of zinc be boiled in water, and then filtered through paper.

'Half an ounce of this solution, and six ounces and a half of rose water, form an excellent collyrium in ophthalmia, after local bleeding.'

PREPARATIONS OF LIME.

Calx. London.—Lime.

Take of white marble a pound; break it into small pieces, and expose these in a crucible to a very strong fire during an hour, or until the carbonic acid be so thoroughly expelled that no air bubbles will be extricated on the addition of acetic acid.

Calx e testis. London.—Lime from shells.

In the same manner lime is also prepared from shells.

In order to obtain lime quite pure, these processes are not sufficient. See CHEMISTRY, article *Lime.*

Liquor calcis. London.—Lime water.

Take of lime half a pound, boiling distilled water twelve pints. Pour the water upon the lime, and let them be agitated together; cover the vessel directly, and set it apart three hours. The solution must be preserved over the undissolved portion of the lime in well stopped glass bottles, and the clear fluid poured off when it is wanted for use.

Solutio calcis, sive aqua calcis. Edinburgh.—Solution of lime, or lime water.

Take of lime fresh burnt half a pound. Put it into an earthen vessel, and sprinkle upon it four ounces of water, keeping the vessel covered until the lime become hot and fall into powder; then let twelve pounds more of water be poured on it, and mix, by agitation, the water with the lime. After the lime shall have subsided, let the agitation be repeated; and do this about ten times, the vessel being kept shut in order to prevent the access of air. Lastly, let the water be filtered through paper, interposing glass rods between the paper and the funnel, that the water may pass through as quickly as possible. The solution is to be preserved in well stopped bottles.

The mode of the London college is preferred by Dr. Thomson.

Qualities.—Lime water is without smell or color; its taste is styptic. It speedily attracts carbonic acid from the air, and therefore requires to be kept in well stopped bottles.

Medical properties.—Antacid and anthelmintic. Dose from f. ℥ß. to Oß. It is generally best to give it combined with an equal quantity of milk.

Murias calcis. London.—Muriate of lime.

Take of the salt which remains after the sublimation of the subcarbonate of ammonia two pounds; water a pint. Mix them, and let the solution be filtered through paper; then evaporate it till the salt becomes dry. The salt is to be preserved in well stopped bottles.

'This preparation is a chloride of calcium. Muriate of lime can only exist in a state of solution in water; and, in evaporating to dryness, the muriatic acid is decomposed and resolved into chlorine and hydrogen; while at the same time the oxide of calcium, forming part of the muriate, parts with its oxygen; the chlorine attaches itself to the calcium, forming a chloride of calcium, which is obtained as a dry salt; and the oxygen to the hydrogen, forming water, which is evaporated.'—Thomson.

Qualities.—A pungent bitter salt, inodorous, soluble in water and alcohol, producing cold during solution.

Medical properties.—Proposed by some in scrofulous disorders but very little used. Dose from gr. j. to grs. iv.

Liquor muriatis calcis. London.—Solution of muriate of lime.

Take of muriate of lime two ounces; distilled water three fluid ounces. Dissolve the muriate of lime in the water, and let the solution be filtered through paper.

Solutio muriatis calcis. Edinburgh.—Solution of muriate of lime.

Take of the harder variety of carbonate of lime (white marble), broken into small pieces, nine ounces; muriatic acid sixteen ounces; water eight ounces. Mix the acid with the water, and gradually add the pieces of carbonate of lime. The effervescence being finished, digest for an hour. Pour off the fluid, and reduce it, by evaporation, to dryness. Let the residue be dissolved in its weight and a half of water, and the solution be filtered.

The chemistry of the preparation ordered by the Edinburgh College is sufficiently obvious. In the solution ordered by the London College, of the chloride of calcium, an actual muriate of lime is formed by the decomposition of the water.

Qualities.—Taste pungent and bitter. Decomposible by the sulphuric, nitric, phosphoric, fluoric, and boracic acids, and by their neutral salts, as well as by the alkalies.

Medical properties.—Recommended by some in scrofulous and glandular affections. Dose from ♏xx. to f. ʒj.

Creta præparata. London.—Prepared chalk.

Take of chalk a pound; add a little water to it, and triturate to a fine powder. Throw this into a large vessel of water; stir it; and, after a short time, pour off the supernatant turbid water into another vessel, and let it be set apart that the powder may subside; finally, let the water be poured off and the powder dried.

Carbonas calcis præparatus. Edinburgh.—Prepared carbonate of lime.

Let carbonate of lime, rubbed to a powder in an iron mortar, and levigated with a little water on a porphyry stone, be put into a large vessel; then pour water upon it, which, after frequently shaking the vessel, is to be decanted off, laden with the fine powder. The subtile powder which subsides when the water remains at rest is to be dried. Let the coarse powder which could not be suspended in the water be again levigated, and treated in the same manner.

Qualities.—Very white, soft, and light. It is a pure carbonate of lime.

Medical properties.—Antacid, and absorbent. Dose from grs xv. to ℈ij. or ʒj.

Murias barytæ. Edinburgh.—Muriate of barytes.

Take of carbonate of barytes, and muriatic acid, of each one part; water three parts. To the water and the acid, mixed together, let the carbonate of barytes be added, broken into small pieces. The effervescence being finished, digest for an hour; then filter, and, after due evaporation, let the solution be set apart for the formation of crystals. Repeat the evaporation so long as any crystals are formed.

The college order a muriate of barytes to be prepared from the sulphate by a more complicated process; but we do not give the process, for the first is sufficient, and the carbonate is a mineral which can always be procured. The muriate of barytes is, more strictly speaking, a chloride of barium.

Qualities.—Muriate of barytes (chloride of barium) is disagreeable and bitter to the taste. It is soluble in water, but not in alcohol. It decrepitates and ultimately melts by heat. It is only employed in the following solution:—

Solutio muriatis barytæ. Edinburgh.—Solution of muriate of barytes.

Take of muriate of barytes one part; distilled water three parts. Dissolve.

Qualities.—Limpid, and without color. Decomposible by the sulphates and nitrates of the earths and metals.

Medical properties.—Stimulant, and deobstruent. It has been employed both in scrofula and syphilis, but it is not at present much thought of. Dose from ♏v. to xx. or more very gradually increased.

Magnesia. London.—Magnesia.

Take of subcarbonate of magnesia four ounces. Burn it in a very strong fire for two hours, or until no effervescence be excited by the dropping of acetic acid into it.

Edinburgh.—Let carbonate of magnesia be subjected to a strong heat in a crucible for two hours, after which keep it in closely stopped bottles.

The heat dissipates the carbonic acid, and leaves the magnesia pure.

Qualities.—White and very soft powder. Not fusible, and requiring for solution an exceedingly large proportion of water.

Medical properties.—See under *subcarbonate of magnesia*.

Magnesiæ subcarbonas. London.—Subcarbonate of magnesia.

Take of sulphate of magnesia a pound; subcarbonate of potassa nine ounces; water three gallons. Let the subcarbonate of potassa be dissolved in three pints of water, and the sulphate of magnesia in five pints, and filter; then let the rest of the water be added to the solution of sulphate of magnesia, and boil it, adding to it, while boiling, the solution of the subcarbonate of potassa, with constant stirring. Strain through linen, and lastly let the powder be repeatedly washed with boiling water, and dried upon bibulous paper, with a heat of 200°.

Carbonas magnesiæ. Edinburgh.—Carbonate of magnesia.

Take of sulphate of magnesia four parts; subcarbonate of potassa three parts; boiling water a sufficient quantity. Dissolve the salts separately in twice their weight of water, and strain, or otherwise free from impurities; then mix them, and immediately add eight times their weight of boiling water. Boil the liquor for a short time, stirring it; then let it continue at rest till the heat be a little diminished, and strained through linen, upon which the carbonate of magnesia will remain. This, after being well washed with pure water, is to be dried with a gentle heat.

In these processes there is obviously a double decomposition; the sulphuric acid leaves the magnesia to unite with the potassa, while the consequently disengaged carbonic acid of the latter attaches itself to the magnesia.

Qualities.—Inodorous, perfectly white, and without much taste; it is exceedingly smooth to the touch, and nearly insoluble in water. It is decomposed by the acids, the alkalies, and neutral salts. A strong heat will also dissipate its carbonic acid, as shown in the preparation of burning magnesia.

Medical properties.—An excellent antacid, stomachic, aperient, and lithontriptic. Only, however, aperient when it encounters an acid in the stomach, so as to form a neutral salt. Dose from grs. xv. to ʒiß. or more.

METALLIC PREPARATIONS.

For an account of the properties and habits of metals see CHEMISTRY. The metals which are employed in medicine are antimony, arsenic, bismuth, copper, iron, lead, mercury, silver, tin, zinc. Mercury and tin are used in their metallic state, but not very commonly. Most of the medicinal articles from this class of bodies are combinations with different mixtures of oxygen, or of acid. Some of sulphur, and other substances.

Preparations of Antimony.

Sulphuretum antimonii præparatum. Edinburgh.—Prepared sulphuret of antimony.

Put sulphuret of antimony, rubbed to powder, in an iron mortar, and levigated on a porphyry stone, with a small quantity of water, into a large vessel; then pour water on it, and, after having frequently agitated the vessel, pour it off laden with the fine powder.

The coarse powder, which the water is not able to suspend, is to be levigated again, and again treated in the same manner.

Qualities.—This powder is of a leaden gray color, is without much smell or taste, and is not soluble in water.

Medical properties.—Alterative. Not very much employed. Dose from grs. v. to ℈j.

Antimonii sulphuretum præcipitatum. London.—Precipitated sulphuret of antimony.

Take of sulphuret of antimony, in powder, two pounds; solution of potassa four pints; distilled water three pints. Mix them, and let the mixture be boiled over a gentle fire for three hours, assiduously stirring it, and occasionally adding distilled water, so as to keep up the same measure. Strain the solution through a double linen cloth directly, and, while it is still hot, drop in gradually so much sulphuric acid as may be necessary to precipitate the powder. Then wash away the sulphate of potassa with hot water, dry the precipitated sulphuret of antimony, and rub it to a fine powder.

Sulphuretum antimonii præparatum. Edinburgh.—Precipitated sulphuret of antimony.

Take of solution of potassa four parts; water three parts; prepared sulphuret of antimony two parts; diluted sulphuric acid a sufficient quantity. Mix the sulphuret with the solution of potassa and the water; then boil them in a covered iron pot over a gentle fire during three hours, frequently stirring with an iron spatula, and adding water as it may be requisite. Let the hot liquor be strained through a double linen cloth; and, when strained, let there be added to it so much sulphuric acid as may be necessary to precipitate the sulphuret, which must be well washed with warm water.

The product of these proceses is a sulphureted hydrosulphuret of oxide of antimony. The following is given as the theory of its formation: 'During the boiling the potassa combines with the sulphur of the sulphuret of antimony, and forms sulphuret of potassa, which, decomposing part of the water, and attracting its disengaged hydrogen, is partly converted into a sulphureted hydrosulphuret of potassa, while its oxygen, aided by the sulphuretted hydrogen, oxidizes the antimony, which is dissolved by the sulphuretted hydrosulphuret of potassa. The sulphuric acid which is now added to the strained solution while it is hot, and which in part contains potassa, oxide of antimony, sulphur, and hydrogen, combines with the potassa, disengaging sulphureted hydrogen gas, and the oxide of antimony is precipitated, combined with the disengaged sulphur, and the remaining sulphureted hydrogen.'

Qualities.—This precipitate is of an orange color; it is without odor, is slightly styptic in taste, and is insoluble. When pure it does not effervesce with acid, so that if adulterated with chalk it may be easily tested.

Medical properties.—Alterative, diaphoretic, and slighly expectorant. Not so much employed as formerly. Dose from gr. i. to grs. iv.

Antimonium tartarizatum. London.—Tartarised antimony.

Take of glass of antimony (see CHEMISTRY), finely powdered, supertartrate of potassa in powder, of each one pound; boiling distilled water one gallon. Mix the glass of antimony and the supertartrate of potassa. and add them gradually to the boiling distilled water, constantly stirring the mixture with a spatula; then boil for a quarter of an hour, and set it aside. When the solution is cold let it be filtered, and evaporate so as to form crystals.

Tartras antimonii. Edinburgh. Olim, *Tartarus emeticus.*—Tartrate of antimony: formerly, tartar emetic.

Take of sulphuret of antimony, and nitrate of potassa, of each an equal weight; supertartrate of potassa a sufficient quantity. Filtrate separately the sulphuret and nitre; and, having well mixed them together, throw them into a red hot crucible. When the deflagration is over, let the red matter be separated from the white crust, and rubbed down to a very fine powder, which must be washed with several effusions of warm water, and subsequently dried.

This powder is now to be rubbed together with an equal weight of supertartrate of potassa, and the mixture boiled in a glass vessel with four times its weight of distilled water during an hour; then strained through paper, and the strained solution set aside in order that crystals may form by evaporation.

In the process of the London College the excess of acid in the supertartrate of potassa acts upon the glass of antimony in such a manner as to leave its sulphur untouched; the tartrate which remains is held in solution with the antimonial tartrate; thence the product is a double salt, the tartrate of potassa and antimony; the same salt is also formed in the other process by the superabundant acid of the supertartrate of potassa combining with antimonial oxides. 'Tartrate of antimony and potassa,' says Dr. Thomson, 'ought, on the principles of the reformed nomenclature, to be the name of this salt;' and he very properly regrets that 'all the colleges have not concurred in adopting the same preparation of antimony for the formation of this important salt.'

Qualities.—Tartar emetic is white, without smell, and has a slightly metallic taste. It is soluble in water; but when kept in solution long is spontaneously decomposed. It is often, we are told, adulterated with supertartrate of potassa and tartrate of lime. When the former is the case it is precipitated from its aqueous solution by the addition of spirit. If the crystals deliquesce its purity is to be suspected. 'It is decomposed by heat, the strong acids, the alkalies, and alkaline carbonates, the earths, hydrosulphurets, some of the metals and their oxides, lime-water, muriate of lime, and acetate of lead, and by the decoctions or infusions of many bitter and astringent vegetables, as those of cinchona bark, rhubarb, galls and catechu; with which therefore it ought never to be conjoined in prescriptions." We think, however, in the face of this chemical objection to the combination of bark and antimony, that we have seen the union attended with advantage in some cases where both remedies have been simultaneously indicated.

Medical properties.—Emetic, sudorific, diaphoretic, and alterative, according to the dose in which it is given. It is one of the very best preparations of antimony, and may, by a due apportionment of dose to the circumstances of the case, be made almost to supersede the other preparations of antimony. Indeed the facility by which it may be minutely divided constitutes one of its advantages. Dose, as an emetic, from one to two grains, as a diaphoretic one-sixth or eighth of a grain. The continental physicians, especially the Italians, administer it in doses of from four to twelve grains in violent inflammations.

Vinum antimonii tartarizati. London.—Solution of tartarised antimony.

Take of tartarised antimony a scruple, boiling distilled water eight fluid ounces, rectified spirit two fluid ounces. Dissolve the tartarised antimony in the boiling distilled water; then let the spirit be added to the filtered solution.

Vinum tartratis antimonii. Edinburgh.—Wine of tartrate of antimony.

Take of tartrate of antimony twenty-four grains, Spanish white wine one pound. Mix, and dissolve the tartrate of antimony.

Wine is not a good menstruum for dividing the tartrate of antimony, as it occasions a slow decomposition of it, occasioning it is said a precipitate of oxide of antimony with a portion of supertartrate of potassa. Dr. Paris remarks 'that, when good sherry wine is employed, no decomposition of the salt takes place; and, if any precipitate occurs, it is tartrate of lime, arising from an accidental impurity in the bitartrate of potassa in the preparation.'

Medical properties.—The same as the salt. Dose ♏ xv. to f. ʒi. From ʒij. to ℥ß as an emetic.

Pulvis antimonialis. London.—Antimonial powder.

Take of sulphuret of antimony in powder a pound, hartshorn shavings two pounds. Mix, and throw them into a broad iron pot that has been heated to whiteness, assiduously stirring till vapors cease to rise. Let what remains be rubbed to powder; and, having put it into a proper crucible, expose it to a fire which is to be gradually raised so as that a white heat be kept up for two hours. Let the residue be rubbed down into very fine powder.

Oxidum antimonii cum phosphate calcis, olim pulvis antimonialis. Edinburgh.—Oxide of antimony with phosphate of lime, formerly antimonial powder.

Take of sulphuret of antimony in coarse powder and hartshorn shavings, each equal parts. Mix, and throw them into a wide iron pot heated to redness, and let them be assiduously stirred until they are burnt into a gray colored matter, which is to be removed from the fire, rubbed to powder, and put into a coated crucible; over which another crucible, having a small hole in its bottom, is to be inverted and luted; then apply the fire, gradually raising it to a white heat, which is to be kept at this heat for two hours. Lastly, reduce the matter when it is cold to a very fine powder.

Sulphur, by the action of heat, is expelled in this process from the sulphuret of antimony, and the metal becomes partially oxidised; this oxide is partially rectified by the subsequent application of heat, and the phosphate of lime of the hartshorn shavings mixes with the antimonial oxide; but whether the mixture be mechanical, or the lime yields part of its phosphoric acid so as to form a phosphate of antimony as well of lime, seems not ascertained. The preparation is uncertain as to strength. It was proposed by Dr. G. Pearson as a close imitation of the celebrated empirical composition which is sold under the name of James's powder.

Qualities.—This powder was formerly much employed as a powerful sudorific at the commencement of fevers; it is at present in much less use than formerly, and perhaps justly so on account of the uncertainty of its dose and operation. It is now principally employed as a mild and alterative diaphoretic, and given in conjunction with guaiacum, calomel, &c. Dose from grs. ij. to grs. vj.

PRÆPARATUM EX ARGENTO.—Preparation of silver.

Argenti nitras. London.—Nitrate of silver.

Take of silver an ounce, nitric acid one fluid ounce, distilled water two fluid ounces. Let the nitric acid and water be mixed together, and the silver dissolved in the mixture on a sand-bath. Then let the heat be gradually increased that the nitrate of silver may be dried. Melt this in a crucible on a gentle fire until, the water having evaporated, the ebullition cease; then pour it directly into proper moulds.

Nitras argenti. Edinburgh.—Nitrate of silver.

Take of pure silver flatted into plates and cut one part, nitric acid diluted two parts, distilled water one part. Dissolve the silver in the acid and water previously mixed together, in a phial with a gentle heat, and let the solution be evaporated to dryness. Then put the mass into a large crucible and place it on the fire, which must be at first gentle and gradually increased till the mass flow in the manner of oil; then pour it into iron pipes previously heated and rubbed with grease. Lastly, the preparation is to be preserved in a well stopped glass vessel.

The silver in this process partly decomposes the acid, it becomes oxidised, and as it oxidises it is dissolved in the remaining acid. The quantity of acid ordered by the colleges is unnecessarily large: ten fluid drachms being amply sufficient for the solution of two ounces of silver.

Qualities.—Nitrate of silver is of a dark gray color, without any smell, but exceedingly pungent and caustic to the taste. It does not deliquesce when properly prepared and constituted. It is soluble in water and alcohol. 'It is blackened and reduced by exposure to light or a strong heat, by phosphorus, hydrogen gas, and the hydrosulphurets; is precipitated from its aqueous solution by mercury, copper, and some other metals; and is decomposed by the alkalies with the exception of ammonia, by the alkaline earths, sulphureted hydrogen, the hydrosulphurets, the sulphuric, muriatic, and arsenious acids, the majority of the neutral salts, and by astringent vegetables, solutions, and hard water.'

Medical properties.—Tonic and antispasmodic internally; escharotic when employed externally. It has been used in chorea and other spasmodic affections, but more especially in epilepsy. Dose from one-sixth of a grain to three or four grains. Orfila regards salt as one of its best antidotes when taken in too large a quantity. Dr. Uwins, in his Treatise on Disorders connected with Indigestion, suggests whether the copious use of salt while the patient is taking this medicine might not prevent that discoloration of the skin which is sometimes the result of the continued employment of the nitrate as an internal remedy.

PRÆPARATA EX ARSENICO.—Preparations of arsenic.

Arsenicum album sublimatum. London.—Sublimed white arsenic.

Rub white arsenic to powder; then put it into a crucible, and applying heat, let it be sublimed in another crucible inverted over the first. A superfluous process.

Liquor arsenicalis. London.—Arsenical solution.

Take of sublimed white arsenic reduced to a very fine powder, subcarbonate of potassa from tartar, of each sixty-four grains, compound spirit of lavender four fluid drachms, distilled water a pint. Let them be boiled together in a glass vessel until the arsenic be entirely dissolved. Add to the solution when it is cold the compound spirit of lavender, and lastly so much distilled water as will make up the whole to a pint.

Solutio arsenicalis. Edinburgh.—Arsenical solution.

Take of oxide of arsenic rubbed to a very fine powder, very pure subcarbonate of potassa, of each sixty-four grains, distilled water fourteen ounces. Boil them together in a glass vessel until all the oxide be dissolved; add to the solution when it is cold half an ounce of the compound spirit of lavender, and so much distilled water as will make the whole sixteen ounces.

Qualities.—In appearance like the compound spirit of lavender. Decomposable by 'lime water, hydrosulphuret of potassa, nitrate of silver, the salts of copper, and instantly forms a precipitate when dropped into an infusion of cinchona bark.'

Medical properties.—Tonic; principally employed in intermittents, and in asthenic head- [illegible] Dr. Thomson tells us that he has given [illegible] decided advantage after cupping and purging in threatened apoplexy, when the strength has been little and the complexion pale. Dose ♏v. gradually increased to ♏xxv. or ♏

PRÆPARATUM E BISMUTHO.—Preparation of bismuth.

Bismuthi subnitras. London.—Subnitrate of bismuth.

Take of bismuth one ounce, nitric acid one fluid ounce and a half, distilled water three pints. Mix six fluid drachms of the distilled water with the nitric acid, and dissolve the bismuth in the diluted acid; then let the solution be filtered; add the remainder of the water to the filtered solution, and set it apart that the powder may subside. Next, the supernatant fluid having been poured off, wash the subnitrate of bismuth with distilled water, and having wrapped it in bibulous paper, let it be dried with a gentle heat.

In this process a hydrated oxide of bismuth is formed, combined with a small proportion of nitric acid.

Qualities.—White, without much smell or taste. Insoluble in water. Sulphureted hydrogen, and all the hydrosulphurets blacken it. Reducible by charcoal.

Medical properties.—Antispasmodic and tonic. Exceedingly useful in those painful affections of the stomach which go under the name of gastrodynia. It is highly lauded by Dr. Yeats and Dr. Uwins. Dose from five grains to eight or ten.

PRÆPARATA E CUPRO.—Preparations of copper.

Ærugo præparata. Dublin.—Prepared verdigris.

Let the verdigris be reduced to powder and the more subtile parts separated in the manner directed for the preparation of chalk.

Cuprum ammoniacum. London.—Ammoniated copper.

Take of sulphate of copper half an ounce, subcarbonate of ammonia six drachms. Rub them together in a glass mortar till the effervescence cease; then wrap up the ammoniated copper in bibulous paper and let it be dried with a gentle heat.

Ammoniaretum cupri. Edinburgh.—Ammoniaret of copper.

Take of pure sulphate of copper two parts, subcarbonate of ammonia three parts. Let them be thoroughly rubbed together in a glass mortar until all effervescence cease, and they form a violet-colored mass, which wrap up in bibulous paper and dry, first on a chalk stone, and subsequently with a gentle heat. Let it be preserved in a well stopped glass phial.

During these processes part of the acid of the sulphate of copper is given to the ammonia. It seems not quite certain whether the resulting compound be 'a subsulphate of oxide of copper and ammonia, or a mixture only of subsulphate of copper and sulphate of ammonia.'

Qualities.—The salt is of a rich blue color; it smells like ammonia and is exceedingly styptic.

Medical properties.—Tonic and antispasmodic. Administered in chorea and epilepsy. Dose a quarter of a grain, gradually increased to four or five grains.

Liquor cupri ammoniat. London.—Solution of ammoniated copper.

Take of ammoniated copper a drachm, distilled water a pint. Dissolve the ammoniated copper in the water, and let the solution be filtered through paper.

The quantity of water used by the London college is stated to be too much, 'it being a curious fact that the salt is more soluble in a smaller quantity of water, owing to the larger quantity decomposing the subsulphate of copper and leaving an insoluble oxide of copper, which is precipitated.'

Medical properties.—Principally used as a detergent to foul ulcers.

Solutio sulphatis cupri composita. Edinburgh.—Compound solution of sulphate of copper.

Take of sulphate of copper, sulphate of alumina, each three ounces; water two pounds; sulphuric acid one ounce and a half. Let the sulphates be boiled in the water in order to dissolve them, and then add the acid to the liquor filtered through paper.

A mere solution of the sulphates.

Medical properties.—Principally employed in ophthalmic affections, largely diluted.

Præparata e Ferro.—Preparations of iron.

Limatura ferri purificata. Edinburgh.—Purified filings of iron.

Having placed a sieve over the filings, let a magnet be applied so that it may draw the filings upwards through the sieve.

Oxydum nigrum purificatum. Edinburgh.—Purified black oxide of iron.

Purify the scales of the black oxide of iron that are found at the anvil of the blacksmith, by the application of the magnet; for the magnet attracts the thinner and purer scales only, and leaves the larger and less pure.

Medical properties.—These imperfect oxides are principally used as anthelmintics. Dose from grs. v. to ℈j.

Ferrum ammoniatum. London.—Ammoniated iron.

Take of subcarbonate of iron, muriatic acid, muriate of ammonia, each a pound. Pour the muriatic acid upon the subcarbonate of iron, and set it aside until bubbles cease to arise. Let the solution be filtered through paper and boiled to dryness. Mix intimately the residuum with the muriate of ammonia; then directly sublime by the application of a strong heat: lastly reduce the sublimed matter to powder.

Murias ammoniæ et ferri. Edinburgh.—Muriate of ammonia and of iron.

Take of red oxide of iron washed and again dried, muriate of ammonia, each equal parts by weight. Mix them well together, and let them be sublimed by a quick fire. Reduce the sublimation to powder, and preserve it in a well stopped phial.

In the process ordered by the London college we are told that a mixture of muriate of ammonia and permuriate of iron is produced: the whole of the subcarbonate of iron employed is not dissolved in the acid.

Qualities.—The color of ferrum ammoniacum is of an orange yellow: it has an odor of saffron and rather a styptic taste. It is soluble and deliquescent.

Medical properties.—Tonic and emmenagogue. From being somewhat aperient it is occasionally admissible in cases where other forms of the metal would disagree. We have found it very useful when the combination is required of a deobstruent and tonic. Dose from grs. iij. to ℈ß or more.

Subcarbonas ferri præparatus. Edinburgh.—Prepared subcarbonate of iron.

Let purified filings of iron be frequently moistened with water till they fall into rust, which rust is to be rubbed into powder.

Qualities.—Color of a reddish brown; taste styptic; very little smell.

Medical properties.—Rust of iron has lately been used for tic douleureux. As a tonic and emmenagogue, and vermifuge, in ordinary cases, the dose is from grs. v. to grs. xv.

Ferri subcarbonas. London.—Subcarbonate of iron.

Take of sulphate of iron eight ounces, subcarbonate of soda six ounces, boiling water a gallon. Let the sulphate of iron and subcarbonate of soda be dissolved separately in four pints of water; then mix the solutions together, and set the mixture aside in order that the powder may subside; then decant off the supernatant fluid; wash the subcarbonate of iron in hot water, and let it be dried, wrapped up in bibulous paper, with a gentle heat.

Carbonas ferri præcipitatus. Edinburgh.—Precipitated carbonate of iron.

Take of sulphate of iron four ounces, subcarbonate of soda five ounces, water ten pounds. Let the sulphate be dissolved in the water; then add the subcarbonate previously dissolved in the water, and mix them together. Wash the carbonate of iron which is precipitated with tepid water, and afterwards dry it.

Here a double decomposition is effected: the sulphuric acid of the sulphate of iron unites with the soda, and the carbonic acid is attracted by the iron.

Qualities.—Taste but slightly styptic. Color brown. No smell. Insoluble in water. Decomposible by heat.

Medical properties.—Nearly the same as the last. When given for tic douleureux the dose is sometimes a drachm frequently repeated.

Ferri sulphas. London.—Sulphate of iron.

Take of iron, sulphuric acid, each eight ounces, water four pints. Mix the acid with the water in a glass vessel, and to these add the iron; then, when the effervescence is over, let the solution be filtered through paper; and, after due evaporation, set it apart for crystals to form. Having poured off the liquor, let the crystals be dried on bibulous paper.

Sulphas ferri. Edinburgh.—Sulphate of iron.

Take of iron and sulphuric acid of each by weight eight ounces, water four pints. Mix the sulphuric acid with the water in a glass vessel, and put the iron to them. When the effervescence is over, filter the solution through paper, and after due evaporation set it apart that crystals may form. The liquor being poured off, dry the crystals on bibulous paper.

In these processes a sulphate of oxide of iron is formed, the oxygen of part of the water combining with the metal, and its hydrogen being sent off in a gaseous form. The oxide thus produced unites with the sulphuric acid, and a sulphate is formed, which is dissolved in that part of the water which has not undergone decomposition.

Qualities.—Color green, taste styptic, very little odor. Soluble in water and fusible by heat. Decomposed by the following substances, 'the earths, the alkalies and their carbonates; lime water, borate of soda, phosphate of soda, muriate of barytes, nitrate of silver, acetate of lead, and every salt the base of which forms an insoluble compound with sulphuric acid and soaps. It is also decomposed by all infusions of vegetable astringents.'

Medical properties.—Tonic, deobstruent, anthelmintic, and emmenagogue. A very useful preparation. Dose from gr. i. to gr. v.

Sulphas ferri exsiccatus. Edinburgh.—Dried sulphate of iron.

Take of sulphate of iron any quantity. Heat it in an unglazed earthen vessel on a moderate fire, until it become quite dry and white.

This process merely deprives the salt of the water of crystallisation.

Oxidum ferri rubrum. Edinburgh.—Red oxide of iron.

Let dried sulphate of iron be exposed to a violent heat so as to convert it into a red colored matter.

The Dublin college properly order this oxide to be washed in order to separate a portion which still remains of the red sulphate.

Ferrum tartarizatum. London.—Tartarised iron.

Take of iron a pound, supertartrate of potassa in powder two pounds, water five pints, or a sufficient quantity. Let the iron and the supertartrate be rubbed together, and subject the mixture in an open glass vessel with a pint of water to the action of the air for twenty days, daily stirring them and preserving a moisture in the mass by additions of distilled water. Then boil it in four pints of distilled water during fifteen minutes, and filter the solution. Evaporate in a water-bath until the tartarised iron be quite dry. Let it be reduced to powder, and preserved in a stopped bottle.

Tartras potassæ et ferri. Edinburgh.—Tartrate of potassa and of iron.

Take of purified filings of iron one part, supertartrate of potassa in powder two parts, water one part. Rub them together and expose them to the air in a shallow earthen vessel for fifteen days, stirring the mass daily with a spatula, and keeping it moist by frequent additions of water. Then let the whole be boiled for a short time in four times its weight of water, and pour off the solution from the other fæces. Evaporate the solution to dryness in a water-bath; and, having rubbed the mass into powder, let it be kept in a well stopped bottle.

It is suggested by Dr. Thomson that the proportion of supertartrate of potassa employed in these preparations may not be sufficient for the quantity of metal; the intention is first to oxidize the iron by a partial decomposition of the water employed, and then to combine this oxide with the superabundant acid of the supertartrate of potassa.

Qualities.—The color of this preparation is of a brownish green; it is without smell, and has but a slightly styptic taste. 'The strong acids, lime water, hydrosulphuret of potassa, and infusions of astringent vegetables decompose it, and are therefore incompatible in formulæ with it.'

Medical properties.—This form of iron has been supposed particularly applicable in dropsy, as combining a diuretic with a tonic quality. Dose ℈ß to ʒß.

Liquor ferri alkalini. London.—Solution of alkaline iron.

Take of iron two drachms and a half, nitric acid two fluid ounces, distilled water six fluid ounces, solution of subcarbonate of potassa six fluid ounces. Mix the acid and the water together, pour the mixture over the iron; and when the effervescence shall have ceased pour off the acid and solution. Add this gradually and at intervals to the solution of subcarbonate of potassa frequently agitating until it become of a brownish red color and no further effervescence be excited. Finally, set it aside for six hours, and pour off the liquor.

In this preparation the diluted acid first oxidises the iron, and, when the subcarbonate of potassa, is added, carbonic acid is extracted and a red precipitate formed, which is ultimately dissolved by the excess of potassa.

Qualities.--Taste slightly styptic and alkaline, exciting a sensation of coldness in the mouth. Water precipitates the alkaline iron, leaving a clear fluid supernatant, which yields, upon evaporation, crystals of nitrate of potassa.

Medical properties.—The same with the other preparations of iron; but scarcely at all employed on account of the uncertainty of its composition and strength.

Tinctura ferri ammoniati. London.—Tincture of ammoniated iron.

Take of ammoniated iron four ounces, proof spirit a pint. Digest and filter.

Tinctura ferri muriatis. London.—Tincture of muriate of iron.

Take of carbonate of iron half a pound, muriatic acid a pint, rectified spirit three pints. Let the acid be poured over the carbonate of iron in a glass vessel, and let the mixture be occasionally shaken for three days. Set it apart that the fæces, if there be any, may subside; then pour off the solution and add to it the spirit.

Edinburgh.—Take of black oxide of iron purified and reduced to powder three ounces, muriatic acid about ten ounces, or sufficient to dissolve the powder. Digest with a gentle heat, and, the powder being dissolved, let so much alcohol be added as will make the whole liquor amount to two pounds and a half.

The London preparation is of a more uniform strength than the Edinburgh formula.

Qualities.—This tincture has a very styptic taste, and is of a yellowish brown color. 'It contains the iron in the state of a chlorate, and when it is distilled a black oxide of iron remains in the retort. With the alkalies and their carbonates it gives a red precipitate, strikes a black color with infusions of astringent vegetables, and forms with mucilage of acacia gum an orange colored jelly. Hence these substances cannot enter into compositions with this tincture.'

Medical properties.—A useful preparation of iron. It has been given in large doses under some circumstances of suppression of urine. Dose generally from ♏xv. to f. ʒß.

Vinum ferri. London.—Wine of iron.

Take of iron one drachm, supertartrate of potassa in powder six drachms, distilled water two pints or so much as will be necessary, proof spirit twenty fluid ounces. Rub the iron and the supertartrate of potassa together, and expose them in an open glass vessel with one fluid ounce of water to the air for six weeks, stirring daily with a spatula, and frequently adding so much distilled water as may be necessary to keep a moisture in the mass. Then dry it with a gentle heat, rub it to powder, and mix it with thirty fluid ounces of distilled water. Let the solution be filtered and then add the spirit.

Qualities.—This is 'a solution of tartrate of iron and potassa, with an excess of supertartrate of potassa,' the iron being being oxidised and dissolved in the acid of the supertartrate.

Medical properties.—A pleasant preparation of iron. Dose from f. ʒj. to f. ℥ß.

PREPARATA EX HYDRARGYRO.—Preparations of mercury.

Hydrargyrum cum creta. London.—Mercury with chalk.

Take of purified mercury (by weight) three ounces; prepared chalk five ounces. Let them be rubbed together until the globules entirely disappear.

In this preparation something seems to be effected between oxidisement and merely mechanical division of the mercury.

Medical properties.—A most excellent alterative, especially in complaints of children that are marked by lymphatic weakness and mesenteric obstruction. Dose for an adult from grs. vi. to ℈j.

Hydrargyri nitrico oxydum. London.—Nitric oxide of mercury.

Take of purified mercury (by weight) three pounds, nitric acid by weight a pound and a half, distilled water two pints. Mix them in a glass vessel and boil until the mercury be dissolved, and a white mass remain after the water is evaporated. Rub this into powder, and put it into another very shallow vessel; then expose it to a gentle heat, and let the fire be gradually raised until red vapors no longer be emitted.

Oxydum hydrargyri rubrum per acidum nitricum. Edinburgh.—Red oxide of mercury by nitric acid.

Take of purified mercury three parts, diluted nitrous acid four parts. Dissolve the mercury, and evaporate the solution over a gentle fire to a white dry mass, which, being reduced to powder, is to be put into a glass cucurbit, and covered with a thick plate of glass. Then adapt a capital to the vessel, and having placed it in a sand-bath let the contained matter be roasted with a fire gradually raised until small red scales be formed.

Qualities.—'When properly prepared this is a peroxide mixed with some nitrate of mercury.' It appears in the form of bright red scales which are corrosive and acrid; they are insoluble in water but totally soluble in nitric acid, and decomposible by a red heat. 'It is sometimes adulterated with red oxide of lead, which may be detected by dissolving one part of the oxide in four of acetic acid; if lead be present the solution has a sweetish taste; and, when sulphureted water is dropped into it, a dirty dark precipitate is thrown down. When pure it is perfectly volatilised when thrown on a red hot iron.'

Medical properties.—This, the red precipitate of common language, is only used as an external application in cases of chronic, inflammatory, and old sores.

Acetas hydrargyri. Edinburgh.—Acetate of mercury.

Take of purified mercury three ounces, diluted nitrous acid four ounces and a half, or a little more than is necessary to dissolve the mercury, acetate of potassa three ounces, boiling water eight pounds. Mix the mercury with the acid; and towards the cessation of the effervescence digest, if necessary, until the mercury be completely disolved. Then dissolve the acetate of potassa in the boiling water, and immediately to this solution, still hot, add the former, and mix them together by agitation. Set the mixture aside to crystallise; then wash the crystals placed in a funnel with cold distilled water, and finally dry them with a very gentle heat.

In preparing the acetate of mercury it is necessary that all the vessels which are used, and the funnel, be of glass.

In this preparation a nitrate of mercury is first procured by the action of the nitrous acid upon the metal, which nitrate is decomposed by the potassa of the acetate uniting with the acid of the salt; in this way a nitrate of potassa is procured which remains dissolved; and the acetic acid of the acetate combines with oxidated metal, and thus forms the acetate of mercury.

Qualities.—This salt should appear in small flat crystals of a silvery whiteness: it is acrid to the taste; soluble in hot water, but not in alcohol, and decomposed by alkalies and heat.

Medical properties.—It is a form of mercury not much used; in the proportion of grs. ii. to f. ℥ij. of rose water, some have recommended it as a wash in certain cutaneous disorders. Dose gr. i. twice a day.

Hydrargyri oxydum cinereum. London.—Gray oxide of mercury.

Take of submuriate of mercury an ounce, lime-water a gallon. Boil the submuriate of mercury in the lime-water, stirring it assiduously until the gray oxide of mercury subside. Let it be washed with distilled water, and then dried.

Oxidum hydrargyri cinereum. Edinburgh.—Gray oxide of mercury.

Take of submuriate of mercury half an ounce, lime-water five pounds. Boil the submuriate in the solution for a quarter of an hour in a slightly covered vessel. Pour off the supernatant fluid, and let the oxide be washed with distilled water and dried.

The lime water decomposes the submuriate, and the gray precipitate is a protoxide. If calomel be considered a proto-chloride of mercury, we must admit (says Dr. Thomson) that the water of the lime-water is decomposed, and its hydrogen, uniting with the chlorine, forms muriatic acid, which converts the lime into a muriate, while its oxygen changes the mercury into the protoxide.

Qualities.— Color gray. Insipid, without smell, and insoluble in water.

Medical properties.—Some have considered this preparation as an exceedingly useful form of mercury, partly on account of the uniformity of its strength. Dose from gr. i. to grs. iij.

Hydrargyri oxydum rubrum. London.—Red oxide of mercury.

Take of purified mercury (by weight) a pound. Put the mercury into a tall glass vessel with a narrow mouth and broad at the bottom. Subject this vessel open to a heat of 600° until the mercury be converted into red scales, which are then to be rubbed into a fine powder.

The heat in this process volatilises the mercury, and the metal in this state attracts oxygen from the air and is thus converted into a red oxide.

Qualities.—This preparation produces sparkling deep red scales, which are small and exceedingly brilliant, without odor, but of a sharp caustic taste.

Medical properties.—Formerly it was considered an excellent form of mercury for syphilis, but is at present very little employed. Dose from one-sixth or eighth of a grain to one grain. It is apt to affect the bowels, and is therefore usually combined with opium. It is employed by some externally as an escharotic.

Hydrargyri oxymurias. London.—Oxymuriate of mercury.

Take of purified mercury (by weight) two pounds, sulphuric acid thirty ounces (by weight), dried muriate of soda four pounds. Boil the mercury with the sulphuric acid in a glass vessel until the sulphate of mercury become dry; rub this when cold with the muriate of soda in a mortar of earthenware; then sublime it in a glass cucurbit, with a heat gradually raised.

Murias hydrargyri corrosivus. Edinburgh.—Corrosive muriate of mercury.

Take of purified mercury two pounds, sulphuric acid two pounds and a half, dried muriate of soda four pounds. Boil the mercury with the sulphuric acid in a glass vessel placed in a sand bath until the material become dry. Mix this when cold in a glass vessel with the muriate of soda; then sublime in a glass cucurbit with a heat gradually raised. Separate the matter sublimed from the scoriæ.

'According to the latest doctrines, the chlorine of the common salt leaves the sodium and uniting with the mercury of the hypersulphate forms a bichloride of mercury which sublimes, while the oxygen of the oxide of mercury combining with the sodium converts it into soda, which unites with the sulphuric acid, and forms sulphate of soda which remains in the bottom of the cucurbit.'

Qualities.—Corrosive sublimate, as it was formerly called, appears in the form of very small shining white crystals, which have a very acrid taste, and are without smell; they effloresce by exposure to the air. It is soluble in water, alcohol, and the acids. Alkalies and oils precipitate and reduce it. 'It is also decomposed by solutions of tartrate, of potassa, and antimony, nitrate of silver and acetate of lead, and forms precipitates in infusions and decoctions of the following vegetable substances. Camomile flowers, horse radish root, columba root, catechu, cinchona-bark, rhubarb root, senna leaves, simaruba bark, oak bark, tea, and in the almond mixture, consequently it is incompatible in extemporaneous formulæ with these substances.

Medical properties.—Formerly very much employed in syphilitic affections; and still constituting the main ingredient of several patent medicinals which profess to contain no mercury in their composition. At present it is more used in chronic affections of the skin than in any other disorder, whether these have or have not a syphilitic origin and character. Dose from one-tenth of a grain to a fourth, two or three times a day.

Liquor hydrargyri oxymuriatis. London.—Solution of oxymuriate of mercury.

Take of oxymuriate of mercury eight grains, distilled water fifteen fluid ounces, rectified spirit a fluid ounce. Let the oxymuriate of mercury be dissolved in the water and the spirit added.

The dose of this solution is from f. ʒß. to f. ʒij, each fluid ounce containing half a grain of the salt. The solution should not be kept long nor exposed to a strong light, as it thus becomes decomposed and throws down calomel. This solution is externally useful in tetters diluted with half its measure of water.

Hydrargyrum præcipitatum album. London.—White precipitated mercury.

Take of oxymuriate of mercury half a pound, muriate of ammonia four ounces, solution of subcarbonate of potassa half a pint, distilled water four pints. Dissolve first the muriate of ammonia, then the oxymuriate of mercury in the distilled water, and add to the mixed solution the solution of subcarbonate of potassa. Let the precipitated powder be washed until it become tasteless, then it is to be dried.

The Dublin College order the precipitate to be made by an addition to the fluid poured off from the precipitated submuriate of a quantity of water of ammonia, which Dr. Thomson remarks is a more simple and a more economical mode of obtaining the product. The corrosive muriate, it will be recollected, is held in solution by the fluid in question, and is precipitated by the ammonia.

Qualities.—Muriate of mercury and ammonia (so Dr. Thomson names it) is without smell or taste; it is a smooth white insoluble powder. When adulterated with white lead the fraud may be detected 'by digesting one part of it in four parts of acetic acid, and adding to the solution a small quantity of sulphuret of ammonia; a black precipitate, insoluble in sulphuric acid, indicates the presence of lead. Chalk and starch are also sometimes mixed with it, and may be detected by heating the preparation in an iron spoon; if pure it is completely volatilised, but if adulterated with starch a black coal is left; or if with chalk a white powder at the bottom of the spoon.

Medical properties.—Used only as an ointment in psora and other affections of the skin.

Hydrargyrum purificatum. London.—Purified mercury.

Pour mercury into an iron retort, and having applied heat distil the purified mercury.

Hydrargyrus purificatus. Edinburgh.—Purified mercury.

Take of mercury six parts, filings of iron one part. Rub them together and distil from an iron retort.

Hydrargyri submurias. London.—Submuriate of mercury.

Take of purified. mercury (by weight) four pounds, sulphuric acid (by weight) thirty ounces, muriate of soda one pound and a half, muriate of ammonia eight ounces. Boil two pounds of the mercury with the sulphuric acid in a glass vessel until the sulphate of mercury be dry; when this is cold let it be triturated with two pounds of mercury in an earthen mortar, that they may be perfectly mixed. Then add the muriate of soda, and rub them together till all globules disappear; afterwards sublime. Reduce the sublimed matter to a very fine powder; pass it through a sieve, and mix it carefully with the muriate of ammonia previously dissolved in a gallon of boiling distilled water. Set it aside that the powder may subside. Pour off the solution, and wash the powder repeatedly with distilled water, boiling until solution of ammonia dropped into it throw nothing down. Finally, reduce it to a very fine powder in the manner directed for the preparation of chalk.

Submurias hydrargyri mitis sive calomelas. Edinburgh.—Mild submuriate of mercury or calomel.

Take of muriate of mercury four parts, purified mercury three parts. Rub the muriate in a glass mortar with a little water in order to prevent the acrid powder from rising; then add the mercury, and again triturate until it be extinguished. Put the dried mass into an oblong phial, one-third only of which it shall fill, and sublime it in a sand-bath. Again let the sublimed powder be triturated, and again sublimed; then reduce it to a fine powder, which is lastly to be well washed with boiling distilled water.

This very important preparation is a protochloride of mercury (and not a submuriate). In the process of the London College, following the old doctrines, the mercury is first formed into a persulphate, which is mixed with the common salt, and converted into corrosive sublimate, but which, at the moment of its formation, is again decomposed by the ammonia of the muriate of ammonia, and converted into calomel. But supposing, as is actually the case, that the corrosive sublimate which is formed is a perchloride, this is changed into calomel by one-half of the chlorine uniting with the additional portion of mercury and forming a protochloride. By triturating metallic mercury, as directed by the two other colleges, with the corrosive muriate the whole mass assumes a gray color. The sublimations render the combination of the mercury with the chloride and its reduction to the state of protochloride complete; but this is not the case in the first sublimation, for both metallic mercury and corrosive muriate are found unchanged in the sublimed mass; and thence the necessity of the second trituration and subsequent sublimations. By repeating, however, the sublimation too often the product is injured, as corrosive muriate is formed in each sublimation. The final trituration and levigation are intended to separate any corrosive muriate that may have been formed. In performing the process, the addition of a little water during the trituration of the ingredients in the first instance is very necessary; as otherwise the operator is apt to suffer extremely from the acrid powder of the corrosive muriate which is elevated.'—Thomson.

Qualities.—Calomel is of a dull white appearance, without odor or taste; it is insoluble. It is rendered black by trituration with lime-water and the alkalies, and it is also decomposed by sulphureted hydrogen and the hydrosulphurets, by antimony, iron, lead, copper, and soap.

Medical properties.—This preparation in different doses, according to circumstances, is in greater use than any other form of mercury. It is employed as a purgative, alterative, and deobstruent, and antispasmodic, and, indeed, as a diuretic and sedative, when combined with other substances and duly proportioned as to dose, which varies from the sixth of a grain to many grains and even scruples.

Submurias hydrargyri præcipitatus. Edinburgh.—Precipitated submuriate of mercury.

Take of diluted nitrous acid, purified mercury, of each eight ounces, muriate of soda four ounces and a half, boiling water eight pounds. Mix the mercury with the diluted nitrous acid, and towards the termination of the effervescence digest with a gentle heat, frequently shaking the vessel. It is necessary for more mercury to be mixed with the acid than it can dissolve, so that a completely saturated solution be obtained.

Dissolve at the same time the muriate of soda in the boiling water; then to this add the other solution while it is yet warm, and mix them very quickly together. After the precipitate has subsided pour off the saline fluid, and wash the submuriate of mercury by frequent affusions of warm water, which are to be poured off each time after the precipitate subsides, until the water come off tasteless.

In this process the mild muriate is mixed with the subnitrate of mercury, by which its powers are modified; for the metal is oxydised to a maximum by solution in nitric acid with heat, and a subnitrate is precipitated by the addition of water. Heat, therefore, ought not to be employed in the process.

Qualities.—Calomel prepared in the above way is smoother and not so heavy as that obtained by sublimation, but otherwise is similar, with the exception of its containing the subnitrate if prepared with heat according to the direction of the college.

Medical properties.—Essentially the same with common calomel.

Hydrargyri sulphuretum nigrum. London.—Black sulphuret of mercury.

Take of purified mercury (by weight) one pound, sublimed sulphur a pound. Let them be rubbed together till the globules disappear.

Sulphuretum hydrargyri nigrum. Edinburgh.—Black sulphuret of mercury.

Take of purified mercury, sublimed sulphur, of each equal weights. Let them be triturated together in a glass mortar with a glass pestle, until the globules of mercury altogether disappear. It may also be made with double the quantity of mercury.

It seems that some chemical combination is effected by the trituration of the mercury with the sulphur, but that the metal is not, as it had been supposed by Fourcroy, at all oxidated.

Qualities.—The black sulphuret of mercury is without taste or smell. The application of heat occasions it to emit sulphurous acid gas. When adulterated with ivory black, which is not seldom the case, the fraud may be detected by throwing the mass on a red hot iron, when ashes will be left if there had been any admixture of the ivory black.

Medical properties.—It has been chiefly employed as an alterative in cutaneous affections, and as a remedy against worms. Dose from gr. v. to ℨß.

Hydrargyri sulphuretum rubrum. London.—Red sulphuret of mercury.

Take of purified mercury (by weight) forty ounces, sublimed sulphur eight ounces. Having melted the sulphur over the fire, mix the mercury, and immediately upon the swelling of the mass remove the vessel from the fire, and cover it with force in order to prevent it from catching fire; then rub it into powder and sublime.

Qualities.—This preparation (cinnabar) is of a bright vivid red color, without taste and insoluble. 'It is sometimes adulterated with red lead, dragon's blood, and chalk: the first is discovered by the same process as was described for discovering it in the red oxide; spirit of wine detects the second by extracting the coloring matter; and the last is discovered by an effervescence being excited by muriatic acid, and the production of sulphate of lime on adding sulphuric acid.

Medical properties.—Deobstruent and alterative. Not at present much employed. Dose for internal use gr. x. to ℨß. Factitious cinnabar, as it has been called, is used by some for fumigating venereal ulcers in the throat.

Subsulphas hydrargyri flavus. Edinburgh.—Yellow subsulphate of mercury.

Take of purified mercury two parts, sulphuric acid three parts. Put them into a glass cucurbit, placed in a sand-bath, and boil them to dryness. Pulverise the white mass left at the bottom of the vessel, and throw it into boiling water. It will be immediately changed into a yellow powder, which is to be washed with frequent affusions of warm water.

In this process a supersulphate of mercury is first formed; but the continued application of heat expels and partly decomposes a portion of the acid, the metal becomes more oxidised, and a subsulphate is produced.

Qualities.—This preparation is of a fine bright yellow; it is without smell, but of an acrid taste. It is changed by rubbing it with mercury into the black oxide; and a red heat reduces it to its metallic state by expelling its oxygen.

Medical properties.—Principally used as an errhine. It has been found extremely useful in chronic ophthalmia, and diseases of the head; but even for this purpose its acrimony requires to be sheathed with some bland powder, as starch or liquorice root, powder in the proportion of grs. v. to gr. j. of subsulphate. In doses of grs. v. it operates as a powerful emetic.

PRÆPARATA E PLUMBO.—Preparations of lead.

Plumbi acetas. London.—Acetate of lead.

Take of subcarbonate of lead a pound, strong acetic acid one pint, boiling distilled water one pint and a half. Mix the acid with the water. To these add the subcarbonate of lead, gradually; then filter the solution through paper, and, having evaporated it until a pellicle appear on the surface, set it apart for the formation of crystals. Pour off the fluid, and let the crystals be dried upon bibulous paper.

Acetas plumbi. Edinburgh.—Acetate of lead.

Take of white oxide of lead any quantity, weaker acetic acid a sufficient quantity. Put the oxide into a cucurbit, and pour over it ten times its weight of the acid. Let the mixture stand upon a warm sand-bath until the acid becomes sweet; then pour it off, and add fresh acid in successive portions, until no more sweetness is communicated. Evaporate all the fluid freed from impurities in a glass vessel to the consistence of thin honey, and set it aside in a cold place for crystals to form, which are to be dried in the shade. Again evaporate the residuary liquor that new crystals may be obtained, and repeat the evaporation until no more be formed.

These processes are seldom employed, the acetate of the shops being generally that which is obtained on a large scale by treating sheets of lead with distilled vinegar.

Qualities.—Acetate of lead (sugar of lead) is possessed of an astringent and sweet taste; it is in the form of white crystals. It is slightly efflorescent, and is soluble. It is decomposed by the alkalies and their carbonates, most of the acids and neutral salts, lime, magnesia, and all the sulphurets; but it is not affected by a solution of gum.

Medical properties.—Powerfully astringent and sedative. Dose from a quarter of a grain to a grain. It is in the general way best to combine it with about half its quantity of opium. Externally it is much used as a collyrium in the proportions of fifteen grains or a scruple to half a pint of water.

Liquor plumbi subacetatis. London.—Solution of subacetate of lead.

Take of semivitrified oxide of lead two pounds, acetic acid (distilled vinegar) a gallon. Mix them, and boil them down to six pints, stirring assiduously; then set the solution aside that the impurities may subside, and strain it.

Qualities.—This solution is of a greenish-straw color, with a sweetish and rather caustic taste. 'It is partially decomposed when largely diluted with distilled water; and with pump water a heavy precipitate immediately takes place; it is also precipitated in the form of a white subsalt by the alkalies and their carbonates; and a black precipitate is produced by the alkaline sulphurets. It is indeed the best test for diluting sulphureted hydrogen in any compound. This solution is also incompatible with solutions of mucilage, the gum of which it coagulates; and it is the most delicate test for mucilage with which we are acquainted.

Medical properties.—Only employed externally. It is called Goulard's extract from having been introduced into practice by a surgeon of Montpelier of that name.

Liquor plumbi subacetatis dilutus. London.—Diluted solution of subacetate of lead.

Take of solution of subacetate of lead a fluid drachm, distilled water a pint, proof spirit a fluid drachm. Mix them.

A superfluous preparation, inasmuch as the dilution is easily made extemporaneously, and of strength according to circumstances.

PRÆPARATA E ZINCO.—Preparations of zinc.

Calamina præparata. London.—Prepared calamine.

Calcine the calamine and beat it to powder; then bring it into a state of very fine powder, in the manner directed for preparing chalk.

Carbonas zinci impurus præparatus. Edinburgh.—Prepared impure carbonate of zinc.

Having rubbed to powder, in an iron mortar, impure carbonate of zinc roasted by those who make brass; and having levigated it with a little water on a porphyry, it is to be put into a large vessel and water poured over it, which, after frequently agitating the vessel, is to be poured off loaded with the powder. The fine powder which subsides after the water has remained at rest is then to be dried. The coarse which the water cannot suspend is again to be levigated and treated as before.

Medical properties.—Calamine is principally employed in the form of a dry powder to the excoriations to which infants are subject, and is an exceedingly useful application.

Oxidum zinci impurum præparatum. Edinburgh.—Prepared impure oxide of zinc.

It is prepared in the same manner as the impure carbonate of zinc.

Zinci oxidum. London.—Oxide of zinc.

Take of sulphate of zinc one pound, solution of ammonia one pint, or so much as may be required, distilled water one pint. Dissolve the sulphate of zinc in the distilled water, and add so much solution of ammonia as may be necessary entirely to precipitate the oxide of zinc. Pour off the solution, wash the powder repeatedly with distilled water, and dry it upon a sand-bath.

Oxidum zinci. Edinburgh.—Oxide of zinc.

Let a large crucible be placed in a furnace filled with burning coals in such a manner as to be somewhat inclined to its mouth, and when the bottom of it is heated to a moderate degree of redness throw into it a piece of zinc of about a drachm weight. The zinc is soon inflamed and converted into white flocculi, which are occasionally to be removed from the surface of the metal by means of an iron spatula, for the completion of the combustion; when the inflammation is over, let the oxide of zinc be removed from the crucible. Then throw in another piece, and let the operation be repeated as often as necessary. Finally, let the oxide of zinc be prepared in the same manner as the impure carbonate of zinc.

The quantity of water ordered by the London College is said to be too small. Mr. Brande as quoted by Dr. Thomson says the word congium should be substituted for octarium.

Qualities.—Insipid, of a pure white color and infusible, insoluble in water and alcohol, but soluble in acids. It is often adulterated with chalk, and sometimes contains white lead. By pouring sulphuric acid on the specimen, the first is discovered by the effervescence which is excited, the second by an insoluble sulphate of lead being formed.

Medical properties.—Tonic and antispasmodic. Considerably employed in chorea and epilepsy. Dose gr. i. to grs. v.

Zinci sulphas, London.—Sulphate of zinc.

Take of zinc broken into small pieces four ounces, sulphuric acid by weight six ounces, water four pints. Mix them in a glass vessel, and, when the effervescence is over, filter the solution through paper; then boil it until a pellicle begin to form on the surface, and set it aside to crystallise.

Edinburgh.—Take of zinc cut into small pieces three parts, sulphuric acid five parts, water twenty parts. Mix, and the effervescence being over digest for a short time on hot sand. Then filter the decanted solution through paper, and after due evaporation set it apart for the formation of crystals.

In these processes the zinc decomposes the water by the aid of the acid, and the oxygen of the water being attracted by the metal hydrogen becomes disengaged with effervescence. The greatest portion of the sulphate of zinc which is used in the shops is prepared by exposing blende in such a way that white vitriol, as it is called, results. This white vitriol is purified by solution in water, the solution being allowed to evaporate slowly in an open vessel containing some granulated zinc; by this process any sulphate of lead that may be mixed with the sulphate of zinc is caused to subside, and the other salts are decomposed by the metallic zinc.

Qualities.—The preparation is probably a supersulphate; its taste is acidulous and metallic, it is without smell. 'It is decomposed by the alkalies, earths, and hydrosulphurets; and throws down a dirty looking precipitate, from astringent vegetable infusions, with which therefore it is incompatible in prescriptions.'

Medical properties.—Tonic, antispasmodic, and astringent. In scruple or half drachm doses it is emetic. It is also employed in external affections, especially in ophthalmic complaints accompanied by a laxity of vessel. Dose as a collyrium ℈j. to half a pint of rose water. Dose for internal administration from one grain to three or four.

Solutio sulphatis zinci. Edinburgh.—Solution of sulphate of zinc.

Take of sulphate of zinc sixteen grains, water eight ounces, diluted sulphuric acid sixteen drops. Dissolve the sulphate of zinc in the water, and, after adding the acid, filter the solution through paper.

Solutio acetatis zinci. Edinburgh.—Solution of acetate of zinc.

Take of sulphate of zinc one drachm, acetate of lead four scruples, distilled water twenty ounces. Dissolve. Let the salts be mixed separately in ten ounces of the water; then mix the solutions, and, after the precipitate has subsided, filter.

Here there is a double decomposition; the sulphate of zinc gives out its sulphuric acid to the oxide of lead contained in the acetate, and the zinc, reduced to the state of oxide, combines with the acid of the acetate of lead; the acetate of zinc remains in solution and is thus easily separated from the sulphate of lead by filtering.

Medical properties.—Employed principally as a collyrium, and in gonorrhœa after the inflammation has subsided.

Sulphurea.—Preparations of sulphur.

Oleum sulphuratum. London.—Sulphureted oil.

Take of washed sulphur two ounces, olive oil a pint. Add the sulphur to the oil gradually, the oil being heated in a very large iron pot; stir the mixture after each addition till union is produced.

Qualities.—Smell fetid and taste acrid, color of a reddish brown; it emits sulphureted hydrogen when subjected to heat.

Medical properties.—Stimulant; and, when employed externally, cleansing or detergent. It was formerly much employed in chronic affections of the chest, under the notion of its healing nature, in doses of from ♏ v. to ♏ xxx.

Potassæ sulphuretum. London.—Sulphuret of potassa.

Take of washed sulphur an ounce, subcarbonate of potassa two ounces. Rub them together and place the mixture in a covered crucible over the fire until they unite.

Sulphuretum potassæ. Edinburgh.—Sulphuret of potassa.

Take of subcarbonate of potassa two parts, sublimed sulphur one part. Rub them together and put them into a large covered crucible, to which, a cover being adapted, apply the fire cautiously until they melt. Preserve the mass in a well closed vessel.

We are told that in order to effect a complete combination the subcarbonate should be exposed in a crucible to a red heat previously to its being rubbed with the sulphur; the water of the subcarbonate would thus be dissipated, and at the same time a portion of the carbonic acid expelled, both of which, when not driven off, alter the product. So that the directions of the colleges for the preparation are defective.

Qualities.—Without much odor when dry, but emitting sulphureted hydrogen when moistened. Taste acrid, texture brittle, breaking with a glassy fracture of a brown color. It attracts moisture from the air, thereby becomes green, and gradually changed into a hydrogureted sulphuret of potassa, combined with a small portion of sulphate of potassa. It is decomposed by acids, and its sulphur sublimes when the mass is exposed to a violent heat.

Medical properties.—Alterative and in some degree diaphoretic. It has been much used to allay the extreme irritation of prurigo, and also employed in other cutaneous, as also in rheumatic and pulmonary disorders. Dose from gr. v. to gr. x.

Sulphur lotum. London.—Washed sulphur.

Take of sublimed sulphur a pound. Pour boiling water upon it, so that the acid, if there be any, may be washed away; then dry it.

Sulphur sublimatum lotum. Edinburgh.—Washed sublimed sulphur.

Take of sublimed sulphur one part, water four parts. Boil the sulphur for a short time in the water; then pour off this water, and by repeated affusions of cold water, let all the acid be washed away. Lastly, dry the sulphur.

Sulphur præcipitatum. London.—Precipitated sulphur.

Take of sublimed sulphur a pound, fresh burnt lime two pounds, water four gallons. Boil the sulphur and the lime together in the water, then filter the liquor through paper, and let as much muriatic acid be dropped into it as may be sufficient to precipitate the sulphur. Lastly, wash this with repeated affusions of water until it lose all taste.

'In the first part of this process a hydrogureted sulphuret of lime is produced, by the combination of the lime and sulphur occasioning a decomposition of part of the water, the hydrogen of which unites with a portion of the sulphur, and forms a hydrosulphuret, while the oxygen with another portion forms sulphuric acid that combines with part of the lime; and thus the solution contains a small portion of sulphate of lime, and a sulphuret of lime, or rather the base of lime, calcium, combined with sulphureted hydrogen. This hydrogureted sulphuret is then decomposed by the muriatic acid, which unites with the lime, and forms a soluble muriate while the sulphur is precipitated, and sulphureted hydrogen gas is disengaged.'—Thomson.

Qualities.—Color white, inclining to green; not materially differing from sublimed sulphur.

Hydrosulphuretum ammonæ. Edinburgh.—Hydrosulphuret of ammonia.

Take of water of ammonia, sulphuret of iron, of each four ounces, muriatic acid eight ounces, water two pounds and a half. Pour the acid previously mixed with the water on the sulphuret, and transmit the evolved gas through the water of ammonia. Preserve the solution in well-stopped phials.

Qualities.—Color of a dark green, odor fetid, and taste acrid. Acids decompose it.

Medical properties.—Sedative. It has been principally employed in diabetes. Dose from ♏ v. gradually increased.

Vegetabilia.—Vegetables.

For collecting vegetables we have the following directions given by the London college.

Vegetables are to be gathered from the soil and place where they grow spontaneously, in a dry season, and when no dew is found upon them; they are to be collected yearly, and any that shall have been kept for more than a year are to be thrown away.

Roots are for the most part to be dug up before the shooting out of their stems or leaves.

Barks are to be collected at that season in which a separation from the wood is more easily effected.

Leaves are to be gathered after the expansion of the flowers, and before the seeds have come to maturity.

Flowers are to be gathered when they are just open.

Seeds are to be collected when ripe, and before they drop from the plant. They ought to be preserved in their seed vessels.

Vegetabilium præparatio. London.—Preparation of vegetables.

Vegetables soon after being gathered, except those which are to be used in a recent state, are to be lightly spread out and dried as quickly as may be, with a gentle heat, so that their color shall not be altered; they are then to be preserved in proper situations or vessels where light and moisture are excluded.

Roots which we desire to be preserved fresh are to be buried in dry sand. The squill root, before drying, is to be denuded of its arid coats, and transversely cut into thin slices.

Pulpy fruits if they be not ripe, or if they be ripe and dried, are to be placed in a damp situation that they may become soft; then the pulp must be pressed out through a hair sieve; then boiled with a gentle heat, frequently stirring; and lastly the water evaporated in a water bath until the pulp acquire a due consistence.

Over the bruised pods of cassia pour boiling water so as to wash out the pulp, which is first to be pressed through a sieve with large holes, and afterwards through a hair sieve; then the water is to be dissipated in a water-bath, until the pulp acquire a due consistence.

The pulp or juice of ripe and fresh fruits is to be pressed through a sieve without boiling.

Vegetabilium exsiccatio. Edinburgh.—The drying of herbs and flowers.

Herbs and flowers should be dried by the gentle heat of a stove or a common fire in such quantity at once as will admit of the operation being very speedily finished; for thus are their powers better preserved, the indication of which is the complete preservation of their natural color.

The leaves of hemlock, and of other plants containing a subtile volatile matter, are immediately upon being dried to be reduced to powder, and kept in well stopped glass vessels.

The root of the sea-quill freed from its outer coat is to be transversely cut into thin slices. The indication of its being properly dried is the retention of its bitterness and acrimony after it has become friable.

Pulparum extractio. Edinburgh.—Extraction of pulps.

Fruits which afford a pulp, if unripe, or if ripe and dry, are to be boiled in a small quantity of water till they become soft; then the pulp should be pressed through a hair sieve, and afterwards boiled with a gentle heat in an earthen vessel, stirring frequently in order to prevent it from burning, until it acquire the consistence of honey.

In like manner the pulp of cassia fistula is to be boiled out from the bruised pod, and then brought to a due consistence by the evaporation of the water. The pulps of fresh and ripe fruits are to be pressed through a sieve without previous boiling.

Succi spissati. Edinburgh.—Inspissated juices.

Beat the fresh substance and press it strongly through a canvas bag so as to obtain the juice, which being put into a wide and shallow vessel, and heated by means of boiling water saturated with sea salt, is to be reduced to the consistence of honey. The mass when cold is to be put into glazed earthen vessels, and moistened with strong alcohol.

Gummi resinæ. London.—Gum-resins.

Separate opium very carefully from all extraneous matter, particularly from that on its outside. Let it be preserved in a soft state proper for forming pills, and in a state of hardness such as can be produced by drying it in the heat of a water-bath, so that it may be reducible to powder.

Those gum resins are to be considered the best which can be selected so free from impurity as to require no purifying operation. If, however, they appear less pure, boil them in water until they soften, and squeeze them by a press through a hempen bag: then set them apart that the resinous matter may subside. Pour off the supernatant fluid, and evaporate it by a water-bath heat, adding the resinous portion towards the end of the operation, that it may combine with the gummy part.

Those gum resins which liquify readily are to be purified by putting them into an ox bladder, and holding them in boiling water until they become sufficiently soft to be freed from impurities by pressing them through a hempen bag.

Dissolve the balsam of storax in rectified spirit and strain; then distil off the spirit by a gentle heat, until the balsam acquire a due consistence.

OLEA EXPRESSA —Expressed oils.

Oleum amygdalarum. London.—Oil of almonds.

Macerate almonds either bitter or sweet in cold water for twelve hours, and bruise them; then express the oil without heat.

Oleum amygdali communis. Edinburgh.—Oil of the almond.

Take fresh almonds and bruise them in a stone mortar; then put them into a hempen bag, and express the oil by a press without heat.

Medical properties.—Demulcent and emollient. Dose from f. ℥ß to f. ℥j.

Oleum lini. London.—Oil of linseed.

Bruise the seeds of common flax, and then express the oil without heat.

Medical properties.—Laxative as well as demulcent and emollient. It has been much recommended by some in hæmorrhoidal affections; but it is principally used either as an external application in cases of burns and scalds, or in the form of enemata. Dose by the mouth from f. ʒß to f. ℥j. as an enema from f. ʒiij. to f. ʒvj.

Oleum ricini. London.—Castor oil.

Bruise the seeds of castor, first deprived of their pellicles, and express the oil without heat.

Olea Distillata.—Distilled or volatile oils.

Olea distillata. London.—Distilled oils.

The seeds of anise and carraway, the flowers of chamomile and lavender, the berries of juniper and all-spice, the tops of rosemary, and the whole plants of the other articles are to be used.

Any one of these is to be put into an alembic, and so much water is to be added as will cover it, the oil is then to be distilled in a large refrigeratory.

The water which distils over with the carraway, peppermint, spearmint, all-spice, and pennyroyal is to be kept for use.

Olea volatilia. Edinburgh.—Volatile oils.

So much water only is to be used as will prevent empyreuma during distillation. The distillation may be immediately commenced after due maceration, and the oil afterwards separated from the water.

It is also necessary to observe in preparing these oils and the distilled waters, that the quality of the materials, their texture, the time of the year, and other circumstances may occasion so many differences, that it is hardly possible to give any certain and general rules which shall strictly apply in all cases. Many things, therefore, which must be regulated by the judgment of the operator, are omitted, and the more general only given.

Oleum anisi. London. *Oleum volatile pimpinellæ anisi*. Edinburgh.—Oil of aniseed.

This is sometimes adulterated with water, spermaceti, or camphor; but the fraud is easily detected, for, on moderately warming the genuine oil, the crystals dissolve, which is not the case with sophisticated. The greater part of the oil of aniseed consumed in this country is prepared in Spain.

Medical properties.—Carminative. Dose ♏v.

Oleum anthemidis. London. *Oleum volatile anthemidis nobilis*. London.—Oil of chamomile.

Medical properties.—Stomachic and carminative. Dose ♏v.

Oleum carui. London.—Oil of carraway.

Medical properties.—Stimulant and carminative. Dose from ♏j. to ♏v

Oleum juniperi. London. *Oleum volatile juniperi communis*. Edinburgh.—Oil of juniper.

This when genuine is soluble in alcohol.

Medical properties.—Diuretic and carminative. Dose ♏iij.

Oleum lavandulæ. London. *Oleum volatile Lavendulæ spicæ*. Edinburgh.—Oil of lavender.

Medical properties.—Stimulant and cordial. Dose from ♏i. to ♏v. on sugar.

Oleum volatile lauri sassafras. Edinburgh.—Oil of sassafras.

Medical properties.—Sudorific, diuretic, and stimulant. Not much employed. Dose ♏ij. to ♏vj.

Oleum menthæ piperitæ. London.—*Oleum volatile Menthæ piperitæ*. Edinburgh.—Oil of peppermint.

Medical properties.—Stimulant and carminative. Dose ♏j. to ♏iij.

Oleum menthæ viridis. London.—Oil of spearmint.

Medical properties.—The same as the peppermint, but less pungent.

Oleum origani. London. *Oleum volatile origani marjoramæ*.—Oil of common marjoram.

Medical properties.—Not used internally. Occasionally applied to a carious tooth to ease the pain, two or three drops being put on a piece of cotton and inserted into the tooth.

Oleum pimentæ. London. *Oleum volatile myrti pimentæ*. Edinburgh.—Oil of pimento.

Medical properties.—Stomachic and stimulant. Dose from ♏iij. to ♏v. in sugar or any proper vehicle.

Oleum pulegii. London.—Oil of pennyroyal.

Medical properties.—Stimulant, but not a much use. Dose ♏ij. to ♏v.

Oleum rosmarini. London. *Oleum volatile rorismarini*. Edinburgh.—Oil of rosemary.

This when long kept deposits crystals of camphor.

Medical properties.—Stimulant. It is used externally in combination with other materials as a liniment. Dose for internal use ♏ij. to ♏vj.

Oleum herbæ juniperi sabinæ. Edinburgh.—Oil of savine.

Medical properties.—Savine is supposed by some to possess specifically emmenagogue properties. Dose of the oil from ♏ij. to ♏iv.

Oleum succini. London.—Oil of amber.

Put the amber into an alembic, and distil from a sand-bath, with a gradually raised heat, an acid liquor, the oil, and a salt impregnated with oil. Then redistil the oil a second time and a third time.

Oleum succini. Edinburgh.—Oil of amber.

Take of amber in powder, and of pure sand equal parts. Mix them together in a glass retort, the capacity of which the mixture only half fills; and, having adapted a large receiver to it, distil in a sand-bath with a gradually increased heat. An aqueous fluid tinged with a little yellow oil will come over first; then a yellow oil with an acid salt; and lastly a black and reddish oil. Pour the fluid from the receiver and separate the oil from the water.

Oleum succini purissimum. Edinburgh.—Pure oil of amber.

Distil the oil of amber mixed with six times its quantity of water, from a glass retort, until two-thirds of the water pass into the receiver. Then separate this purified oil from the water and preserve it in well stopped phials.

Qualities.—Exceedingly strong and unpleasant odor. Insoluble in water and only partially soluble in alcohol.

Medical properties.—Stimulant and rubefacient. Occasionally it has been used internally in cases of obstructed menstruation, and in some hysteric and spasmodic complaints. Dose ♏v. to ♏x. Externally it is used in combination with opium in hooping cough and rheumatic affections, and tic douleureux.

Oleum terebinthinæ rectificatum. London.—Rectified oil of turpentine. Take of oil of turpentine a pint, water four pints: distil.

Oleum volatile pini purissimum. Edinburgh.—Purified oil of turpentine.

Take of oil of turpentine one part, water four parts. Distil so long as any oil comes over.

Medical properties.—Anthelmintic, antispasmodic, and antirheumatic. Dose for worms f. ℥j.; for epilepsy ♏xxx.; for rheumatism f. ʒj. Its effects on the kidneys may be guarded against by combining it with acacia mucilage, or giving this mucilage for drink in combination with barley water.

Aquæ Distillatæ.—Distilled waters.

The London college gives the following direction for the preparation of distilled waters.

Waters are to be distilled from dry plants unless it be otherwise ordered; because fresh plants cannot be procured at all times of the year. When fresh plants are employed, the weight of them ordered is to be doubled.

To every gallon of these waters let five fluid ounces of proof spirit be added, in order to preserve them from spoiling.

Aqua distillata. London.—Distilled water.

Take of water ten gallons. First distil four pints which are to be thrown away, and then distil four gallons. Keep the distilled water in a glass bottle.

Aqua distillata. Edinburgh.—Distilled water.

Let water be distilled in clean vessels until two-thirds of the quantity employed have passed over.

'Distilled water is necessary in formulæ containing any of the following substances: acidum sulphuricum, acidum citricum, antimonium tartarizatum, argenti nitras, cuprum ammoniatum, ferrum tartarizatum, hydrargyri oxymurias, liquor ammoniæ, liquor plumbi acetatis, liquor potassæ, plumbi superacetas, solutio muriatis barytæ, vinum ferri, zinci sulphas, ferri sulphas.' *Thomson.*

Aqua anethi. London.—Dill water.

Take of dill seeds bruised a pound, pour upon them so much water as during the distillation may be sufficient to prevent empyreuma. Let a gallon be distilled.

Aqua carui. London.—Carraway water.

Take of bruised carraway seeds a pound, pour on them water enough to prevent empyreuma during distillation. Let a gallon be distilled.

Aqua citri aurantii. Edinburgh.—Water of orange peel.

Take of fresh orange peel two pounds. Add so much water that, when ten pounds have been distilled off, there shall remain sufficient to prevent empyreuma. After due maceration distil ten pounds, to which add five ounces of diluted alcohol.

Aqua citri medicæ. Edinburgh.—Water of lemon peel, prepared in the same manner as the last.

Aqua cinnamomi. London. *Aqua lauræ cinnamomi.* Edinburgh.—Cinnamon water.

Take of bruised cinnamon bark a pound, or of oil of cinnamon by weight five scruples.

Macerate the oil or the bark in water for four-and-twenty hours, then add a sufficient quantity of water to prevent empyreuma after the distillation. Let a gallon be distilled.

Aqua lauri cassiæ. Edinburgh.—Water of Cassia bark. Prepared in the same manner as the last.

Aqua fœniculi. London.—Fennel water.

Take of fennel seeds bruised a pound. Pour on them a sufficient quantity of water to prevent empyreuma. Let a gallon be distilled.

Aqua menthæ piperitæ. London. Edinburgh.—Peppermint water.

Take of peppermint a pound and a half, or double the quantity of the fresh herb. Pour upon it so much water as will prevent empyreuma. Let a gallon be distilled.

Aqua menthæ viridis. London.—Spearmint water.

Take of spearmint a pound and a half, or double the quantity if the fresh herb be employed. Distil a gallon in the same manner as above.

Aqua pimentæ. London.—*Aqua myrti pimentæ.* Edinburgh.—Pimento water.

Take of pimento berries bruised half a pint, water a pint. Macerate the berries in the water for four-and-twenty hours, and distil a gallon (ten pounds, Edinburgh) in the same manner as above.

Aqua pulegii. London.—*Aqua menthæ pulegii.* Edinburgh.—Pennyroyal water

Take of pennyroyal a pound and a half, or double the quantity if the fresh herb be used. Distil a gallon (ten pints, Edinburgh) in the same manner as above.

Aqua rosæ. London.—*Aqua rosæ centifoliæ.* Edinburgh.—Rose water.

Take of the petals of the hundred leaved rose. eight pounds (six pounds, Edinburgh), let a gallon (ten pints, Edinburgh) be distilled as above.

Infusa.—Infusions.

'The substances which water without the aid of boiling can extract from vegetable matter submitted to its action are gum, mucus, extractive tannin, the bitter and narcotic principles, gum resin, volatile oil, acids, and alkalies, a range which includes most of the principles on which the medical properties of plants depend. These principles also are less liable to be altered by infusion than by decoction, and consequently this form of preparation is to be preferred in every instance to which it is applicable. The strength and quality of the infusions are varied by the degree of temperature of the water; those made with hot water being necessarily stronger, but particularly in the case of bitters; cold infusions are more grateful.

'Infusions, like decoctions, are liable to undergo spontaneous decomposition, if kept even for a few days, and therefore the London college has properly directed half a pint only to be made at one time, thus regarding them as extemporaneous prescriptions.' Thomson.

Infusum anthemidis. London.—*Infusum anthemidis nobilis.* Edinburgh.—Infusion of chamomile.

Take of chamomile flowers two drachms, boiling water half a pint. Macerate for ten minutes (twenty-four hours, Edinburgh) in a slightly covered vessel, and strain.

'This infusion precipitates solution of isinglass whitish; infusion of yellow cinchona bark, white; solution of sulphate of iron, and of tincture of muriate of iron, black; solution of nitrate of silver, white; of oxymuriate of mercury, pale brown; and of acetate and superacetate of lead, yellowish-white. These substances, therefore, are incompatible in prescription with this infusion.'

Medical properties.—Stomachic and tonic. Dose from f. ℥j. to f. ʒij.

Infusum armoraciæ compositum. London.—Compound infusion of horse radish.

Take of fresh horse radish root sliced, of mustard seed bruised, of each one ounce, boiling water a pint. Macerate for two hours in a slightly covered vessel, and strain; then add one fluid ounce of compound spirit of horse radish.

'This infusion precipitates infusion of galls, yellowish, and infusion of yellow cinchona bark, white. The solutions of the pure alkalies do not affect it, but with their carbonates whitish precipitates are produced, as is also the case with solution of oxymuriate of mercury; while nitrate of silver produces a precipitate of a brown color. Hence all those substances, except the pure alkalies, are incompatible in formulæ with this infusion.'

Medical properties.—Stimulant. Useful in paralysis. Dose from f. ℥j. to f. ʒiij.

Infusum aurantii compositum. London.—Compound infusion of orange peel.

Take of dried orange peel two drachms, fresh lemon peel one drachm, bruised cloves half a drachm, boiling water half a pint. Macerate for fifteen minutes in a vessel lightly covered, and strain.

'This infusion precipitates sulphate of iron, black; and also produces precipitates with superacetate of lead, infusion of yellow cinchona bark, and lime water.'

Medical properties.—Stomachic. Dose f. ʒiß.

Infusum calumbæ. London. *Infusum colombæ.* Edinburgh.—Infusion of calumba.

Take of calumba root sliced one drachm, boiling water half a pint. Macerate in a slightly covered vessel for two hours, and strain.

'This affords precipitates with infusion of yellow cinchona bark, lime-water, and solution of oxymuriate of mercury.'

Medical properties.—Stomachic. Dose f. ʒiß.

Infusum caryophyllorum. London.—Infusion of cloves.

Take of bruised cloves a drachm, boiling water half a pint. Macerate for two hours in a lightly covered vessel, and strain.

'This affords precipitates with infusion of yellow cinchona bark, the strong acids, and lime-water. Solution also of sulphate of iron occasions a copious black precipitate; sulphate of zinc, superacetate of lead, and nitrate of silver, brown precipitates. It also decomposes tartarised antimony.'

Medical properties.—A warm stomachic. Dose f. ʒiß.

Infusum cascarillæ. London.—Infusion of cascarilla.

Take of cascarilla bruised half an ounce, boiling water half a pint. Macerate for two hours in a vessel lightly covered, and strain.

'This is incompatible in formulæ with the following substances, which it precipitates: lime-water, infusion of galls, infusion of yellow cinchona bark, solution of nitrate of silver, acetate and superacetate of lead, sulphate of zinc, and sulphate of iron, which is slowly thrown down of a pale olive color.'

Medical properties.—Tonic, stimulant, and perhaps expectorant. Dose f. ʒiß.

Infusum catechu compositum. London.—Compound infusion of catechu.

Take of extract of catechu two drachms and a half, bruised cinnamon bark half a drachm, boiling water half a pint. Macerate for an hour in a vessel lightly covered, and then strain.

Infusum acaciæ catechu. Edinburgh.—Infusion of catechu.

Take of extract of catechu pulverised two drachms and a half, cinnamon bark bruised half a drachm, boiling water seven ounces, simple syrup one ounce. Macerate the extract and the bark with the water for two hours, in a covered vessel; then strain and add the syrup.

'The following substances precipitate the tannin of this infusion or otherwise alter its properties, and therefore ought not to be ordered in formulæ with it:—Solution of isinglass, infusion of yellow cinchona bark, the strong acids, sulphate of iron, sulphate of zinc, oxymuriate of mercury, tartarised antimony, and superacetate of lead.'

Medical properties.—Astringent. Dose f. ʒiß.

Infusum cinchonæ. London.—Infusion of cinchona bark.

Take of lanced-leaved cinchona bark bruised half an ounce, boiling water half a pint. Macerate for two hours in a lightly covered vessel, and strain.

Infusum cinchonæ lancifoliæ. Edinburgh.—Infusion of cinchona.

Take of cinchona bark bruised one ounce, water one pound. Macerate for twenty-four hours, agitating frequently, and strain.

'These infusions afford precipitates with the following substances: the strong acids, the alkaline carbonates, lime-water, solutions of sulphate of iron, sulphate of zinc, nitrate of silver, oxymuriate of mercury, oxide of arsenic, subcarbonate of potassa, and tartarised antimony; the aqueous infusions and decoctions of chamomile flowers, calumba, cascarilla, horse-radish, cloves, catechu, orange peel, foxglove, senna, rhubarb, valerian, simaruba, and elm-bark.'

Medical properties.—Tonic. Dose f. ʒiß.

Infusum cuspariæ. London.—Infusion of cusparia.

Take of cusparia bark bruised two drachms, boiling water half a pint. Macerate for two hours in a lightly covered vessel, and strain.

'The solution of sulphate of iron throws down a greenish-yellow precipitate, and sulphate of zinc a yellowish one; nitrate of silver, oxymuriate of mercury, superacetate of lead, infusions of galls and of catechu, also produce precipitates in it. Tartarised antimony is slowly decomposed, and therefore cannot properly be ordered in formulæ with this infusion.'

Medical properties.—Tonic and stimulant. Dose f. ʒiß.

Infusum digitalis. London.—Infusion of foxglove.

Take of the dried leaves of foxglove a drachm, boiling water half a pint. Macerate in a lightly covered vessel for two hours, and strain; then add of spirit of cinnamon half a fluid ounce.

Infusum digitalis purpureæ. Edinburgh.—Infusion of foxglove.

Take of dried foxglove leaves one drachm, boiling water eight ounces, spirit of cinnamon one ounce. Macerate the leaves with the water during two hours in a vessel lightly covered; then, the spirit being added, strain.

'The solution of sulphate of iron slowly throws down a pale precipitate from these infusions; superacetate of lead, and infusion or decoction of yellow cinchona bark, produce instantaneous and copious precipitates.'

Medical properties.—Diuretic, &c. Dose from f. ʒij. to f. ℥j.

Infusum gentianæ compositum. London.—Compound infusion of gentian.

Take of gentian root sliced, orange peel dried of each a drachm, fresh lemon peel two drachms, boiling water twelve fluid ounces. Macerate for an hour in a vessel lightly covered, and strain.

Edinburgh.—Take of gentian root sliced half an ounce, dried orange peel bruised, coriander seeds bruised, of each a drachm, diluted alcohol four ounces, water one pound. First pour on the alcohol, and after three hours the water; then macerate for twelve hours without heat, and strain.

'The solution of acetate of lead throws down a copious precipitate in this infusion, and sulphate of iron strikes a brown color, but no precipitate takes place for twelve hours.'

Medical properties.—Tonic and stomachic. Dose f. ℥iß.

Infusum lini compositum. London.—Compound infusion of linseed.

Take of linseed bruised one ounce, liquorice root sliced half an ounce, boiling water two pints. Macerate for four hours in a vessel lightly covered, and strain. Let the vessel stand near the fire.

Infusum lini usitatissimi. Edinburgh.—Infusion of linseed.

Take of linseed an ounce, bruised liquorice root two drachms, boiling water two pounds. Digest during four hours in a lightly covered vessel, and strain.

'This infusion is a solution of mucus nearly in its pure state. It is clear, colorless, inodorous, and nearly insipid. Alcohol precipitates the mucus in white flocculi, and precipitates are also produced by subacetate and acetate of lead, and the tincture of muriated iron; hence these substances are incompatible in formulæ with this infusion.'

Medical properties.—Demulcent. Dose f. ℥ij.

Infusum quassiæ. London.—Infusion of quassia.

Take of quassia wood, chipped, a scruple, boiling water half a pint. Macerate for two hours in a lightly covered vessel, and strain.

Infusum quassiæ excelsæ. Edinburgh.—Infusion of quassia.

Take of quassia wood, rasped, half a drachm, boiling water eight ounces. Macerate in a lightly covered vessel for two hours, and strain.

'These infusions are not altered by any of the substances usually employed as adjuncts to bitters, and by two only of the metallic salts. Nitrate of silver slowly throws down soft yellow flakes, and acetate of lead a white precipitate.'

Medical properties.—Tonic. Dose f. ℥iß.

Infusum rhæi. London.—Infusion of rhubarb.

Take of rhubarb, sliced, a drachm, boiling water half a pint. Macerate for two hours in a vessel lightly covered, and strain.

Edinburgh.—Take of rhubarb root, bruised, half an ounce, boiling water eight ounces, spirit of cinnamon one ounce. Macerate the root with the water in a covered vessel during twelve hours; then add the spirit, and strain.

'The following substances either occasion precipitates in these infusions, or otherwise alter their properties, and are therefore incompatible in formulæ with them: the strong acids and lime-water, solutions of sulphate of iron, sulphate of zinc, nitrate of silver, oxymuriate of mercury, acetate of lead, tartarised antimony, and infusions of catechu, cinchona, and cusparia.'

Medical properties.—Tonic and aperient. Dose of the London formula from f.℥j to f. ℥iij, half the quantity of the Edinburgh.

Infusum rosæ compositum. London.—Compound infusion of roses.

Take of the dried petals of the red rose half an ounce, boiling water two pints and a half, diluted sulphuric acid three fluid drachms, double refined sugar an ounce and a half. Pour the water on the rose petals in a covered glass vessel; then drop in the acid, and macerate for half an hour; lastly, strain the liquor and add the sugar.

Infusum rosæ gallicæ. Edinburgh.—Infusion of the red rose.

Take of the dried petals of the red rose one ounce, boiling water two pounds and a half, sulphuric acid diluted half an ounce, refined sugar one ounce. Macerate the petals with the water in an earthen vessel which has not been glazed with lead for four hours; then pour in the acid, strain the liquor, and add the sugar.

'The incompatible substances with these infusions are those which are decomposed by the sulphuric acid. The sulphates of iron and zinc, although they do not immediately alter it, yet slowly produce dark-colored precipitates after some hours.'

Medical properties.—Refrigerant and astringent. Dose f. ℥iß.

Infusum sennæ compositum. London.—Compound infusion of senna.

Take of senna leaves an ounce and a half, ginger root sliced a drachm, boiling water a pint. Macerate during an hour in a lightly covered vessel, and strain the liquor.

Infusum cassiæ sennæ. Edinburgh.—Infusion of senna.

Take of senna leaves six drachms, ginger root bruised a scruple, boiling water nine ounces. Macerate in a lightly covered vessel for an hour, and strain.

'These infusions are precipitated by the strong acids, the alkaline carbonates, lime-water. solutions of nitrate of silver, oxymuriate of mercury, superacetate of lead, tartarised antimony, and infusion of yellow cinchona bark, which are consequently incompatible in formulæ with them.'

Medical properties.—Aperient. Dose, when given alone, from f. ℥iij. to f. ℥iv.

Infusum sennæ compositum. Edinburgh.—Infusion of tamarinds and senna.

Take of preserved tamarinds one ounce, senna leaves one drachm, coriander seeds bruised half a drachm, raw sugar half an ounce, boiling water eight ounces. Macerate in a covered earthen vessel which is not glazed with lead, frequently shaking, and at the end of two hours strain.

Tamarinds considerably cover the nauseous flavor of the senna.

Infusum simaroubæ. London.—Infusion of Simaruba.

Take of Simaruba bark bruised half a drachm, boiling water half a pint. Macerate for two hours in a lightly covered vessel and strain.

'The alkaline carbonates and lime water render this infusion milky, and the following substances occasion precipitates. Nitrate of silver, oxymuriate of mercury, superacetate of lead, infusion of galls, catechu, and yellow cinchona bark.'

Medical properties. Tonic and antidysenteric. Dose f. ℥iß

Infusum tabaci. London.—Infusion of tobacco.

Take of tobacco leaves a drachm, boiling water a pint. Macerate in a lightly covered vessel during an hour and strain.

Medical properties. Used as an enema in strangulated hernia, in ileus and other obstinate derangements of the bowels.

MUCILAGINES.—Mucilages.

In pharmacy mucilage implies, as well as a simple solution of gum or mucus in water, any solution of a thick and adhesive nature resembling in its appearance the solutions of gum.

Mucilago acaciæ. London.—Mucilage of acacia.

Take of acacia gum in powder four ounces, boiling water half a pint. Rub the gum with the water gradually adding the latter until a mucilage be formed.

Mucilago acaciæ arabicæ. Edinburgh.—Mucilage of gum arabic.

Take of gum arabic in powder one part, boiling water two parts. Digest with occasional agitation until the gum be dissolved; then strain the mucilage through linen.

'The strong acids act on mucilage as they do on gum, but when diluted they do not alter mucilage. Alcohol converts it into a white curd, but proof spirit produces scarcely any alteration; no change is produced by spirit of nitric ether, but sulphuric ether, and compound spirit of ether, precipitate a thick, white, tenacious curd. Tincture of muriate of iron, even when diluted, converts mucilage into a brownish or orange-colored insoluble jelly; and subacetate of lead gives a copious, dense, flaky, precipitate, which is a compound of gum and oxide of lead, while no change is produced by the following metallic substances: superacetate of lead, green sulphate of iron, sulphate of zinc, oxymuriate of mercury, and tartarised antimony; nor by the alkalies, or the neutral salts.'

Medical properties.—Demulcent. Dose from f. ℥ß. to ℥iß.

Mucilago astragali tragacanthæ. Edinburgh.—Mucilage of tragacanth.

Take of gum tragacanth in powder two drachms, boiling water eight ounces. Macerate for four-and-twenty hours, and triturate the gum carefully that it may be dissolved; then strain the mucilage through linen.

Medical properties.—The same as the acacia.

Mucilago amyli. London. Edinburgh. Mucilage of starch.

Take of starch three drachms, water a pint. Rub the starch, gradually adding the water; then boil until a mucilage be formed.

Medical properties.—Demulcent. It is a common and good vehicle for giving anodynes in enemata.

DECOCTA.—Decoctions.

Decoctum aloes compositum. London.—Compound decoction of aloes.

Take of extract of liquorice half an ounce; subcarbonate of potassa two scruples; powdered extract of spiked aloes, powdered myrrh, and saffron, of each a drachm: water a pint. Boil down to twelve fluid ounces; then add compound tincture of cardamoms four fluid ounces.

'This decoction is decomposed by all the strong acids; corrosive muriate of mercury produces a pale brown precipitate; while tartarised antimony, sulphate of zinc, and superacetate of lead produce white curdy precipitates.'

Medical properties.—Cathartic and emmenagogue. It is somewhat similar to the well known beaume de vie. Dose from f. ℥ß. to f. ℥ij.

Decoctum althææ compositum. Edinburgh.—Decoction of marsh mallows.

Take of marsh mallow root dried and bruised four ounces, raisins stoned two ounces, water seven pounds. Boil down to five pounds. Set aside the strained liquor, and when the dregs have subsided decant it.

Medical properties.—Demulcent. Dose ad libitum.

Decoctum anthemidis nobilis. Ediuburgh.—Decoction of chamomile.

Take of chamomile flowers dried one ounce, carraway seeds bruised half an ounce, water five pounds. Boil during a quarter of an hour, and strain.

Decoctum cinchonæ. London.—Decoction of cinchona bark.

Take of lance-leaved cinchona bark bruised an ounce, water a pint. Boil for ten minutes in a vessel lightly covered, and strain the liquor while it is hot.

Decoctum cinchonæ lancifoliæ. Edinburgh.—Decoction of lance-leaved cinchona bark.

Take of cinchona bark in powder one ounce, water one pound and a half. Boil during ten minutes in a covered vessel, and strain the liquor while it is hot.

For *medical properties*, and incompatibles, see infusion of cinchona.

Decoctum cydoniæ. London.—Decoction of quince seeds.

Take of quince seeds two drachms, water a pint. Boil them over a gentle fire during ten minutes; then strain.

'This is coagulated by alcohol, acids, and most of the metallic salts, which therefore are incompatible in formulæ with it: it must be used as soon as it is made.'

Medical properties.—Demulcent: ad libitum.

Decoctum daphnes mezerii. Edinburgh.—Decoction of mezereon.

Take of the bark of mezereon root two drachms, liquorice root bruised half an ounce, water three pounds. Boil down to two pounds with a gentle heat, and strain.

Medical properties.—Alterative. It has been employed in old syphilitic affections, and in chronic rheumatism; and in several forms of cutaneous disorder.

Decoctum dulcamaræ. London.—Decoction of woody nightshade.

Take of the stalks of woody nightshade sliced one ounce, water a pint and a half. Boil down to a pint, and strain.

Medical properties.—Diuretic and narcotic. It has been used in some chronic disorders of the skin. Dose f. ℥ß to f. ℥i.

Decoctum Geoffroyæ inermis. Edinburgh—Decoction of cabbage-tree bark.

Take of cabbage-tree bark in powder one ounce, water two pounds. Boil with a gentle heat down to one pound, and strain.

Not much used in this country.

Decoctum guiaiaci compositum. Edinburgh.—Compound decoction of guaiacum.

Take of guaiacum wood rasped three ounces; raisins two ounces; sliced sassafras root, bruised liquorice root, of each one ounce; water ten pounds. Boil the guaiacum wood and the raisins in the water over a gentle fire to five pounds, adding the roots towards the end of the boiling; then strain.

Medical properties.—Alterative and antirheumatic. Dose f. ℥iv. to f. ℥viij.

Decoctum hordei. London, (distichi, Edinburgh).—Decoction of barley.

Take of pearl barley two ounces, water four pints and a half (five pounds Edinburgh). First wash any extraneous substances away that may be adhering to the barley; then, having poured on it half a pint of water, boil for a few minutes. This water being thrown away, let the remainder be added boiling; then boil it to two pints and strain.

Decoctum hordei compositum. London.—Compound decoction of barley.

Take of decoction of barley two pints, figs sliced two ounces, liquorice root sliced and bruised half an ounce, raisins stoned two ounces, water a pint. Boil to two pints, and strain.

Medical properties.—Demulcent: ad libitum.

Decoctum lichinis London (Islandici, Edinburgh).—Decoction of liverwort.

Take of liverwort one ounce, water a pint and a half (two pounds Edinburgh). Boil to a pint, and strain.

Medical properties.—Demulcent and tonic. Dose from f. ℥ij. to f. ℥iij.

Decoctum malvæ compositum. London.—Compound decoction of mallows.

Take of mallows dried an ounce, chamomile-flowers dried half an ounce, water a pint. Boil during a quarter of an hour, and strain.

Medical properties.—Demulcent. Used for fomentations and enemas.

Decoctum papaveris. London.—Decoction of poppy.

Take of the white poppy capsules bruised four ounces, water four pints. Boil for a quarter of an hour, and strain.

Medical properties.—Anodyne. Used for fomentations.

Decoctum quercûs. London (roboris, Edinburgh).—Decoction of oak bark.

Take of oak bark one ounce, water two pints (two pounds and a half Edinburgh). Boil to a pint, and strain.

'This decoction is precipitated by solutions of isinglass, infusion of yellow cinchona bark, the carbonates of the alkalies, the aromatic spirit of ammonia, lime-water, and solutions of sulphate of iron, acetate of lead, oxymuriate of mercury, and sulphate of zinc, which are therefore incompatible in formulæ with it.'

Medical properties.—Astringent and tonic. It is useful as a gargle in cases of relaxed tonsils or uvula, and as a wash in procidentia ani et uteri.

Decoctum sarsaparillæ. London.—Decoction of sarsaparilla.

Take of sarsaparilla root sliced four ounces, boiling water four pints. Macerate during four hours in a vessel lightly covered and placed near the fire; then take the sarsaparilla out and bruise it. Return it to the liquor and macerate in the same way for two more hours; then boil it down to two pints, and strain.

Decoctum smilaris sarsaparillæ. Edinburgh.—Decoction of sarsaparilla.

Take of sarsaparilla sliced six ounces, water eight pounds. Digest during two hours in a temperature of about 195°; then take the root out and bruise it; in this state return it to the liquor, and boil down to two pounds, over a gentle fire; then express and strain.

'These bruisings and macerations,' Dr. Thomson tells us, 'are rather worse than superfluous. The entire root, merely bruised and macerated in water at 180° of Fahrenheit, will yield up all its medicinal properties. It affords precipitates with lime-water, solution of muriate of barytes and of acetate of lead, which are therefore incompatible in formulæ with it.'

Decoctum sarsaparillæ compositum. London.—Compound decoction of sarsaparilla.

Take of sarsaparilla decoction boiling four pints; sassafras root sliced, guaiacum root rasped, liquorice root bruised, of each an ounce; bark of mezereon root three drachms. Boil for a quarter of an hour; then strain.

Medical properties.—Sarsaparilla decoction is employed as an alterative and an adjunct to mercury. The compound decoction is likewise used for the same purpose, as well as for several cutaneous disorders and rheumatic affections. Dose f. ℥iv.

Decoctum senegæ. London.—*Decoctum polygalæ senegæ*. Edinburgh.—Decoction of seneka.

Take of seneka root an ounce, water two pints

Boil to a pint, and strain. Dose f. ℥iß. to f. ℥iij. See MATERIA MEDICA,

Decoctum veratri. London.—Decoction of white hellebore.

Take of white hellebore root bruised one ounce, water two pints, rectified spirit two fluid ounces. Boil the root with the water down to a pint, and strain; then, when the decoction is cold, let the spirit be added.

Medical properties.—Principally employed as a lotion in cutaneous eruptions.

EXTRACTA.—Extracts.

These are preparations obtained by evaporating solutions of vegetable matter to the consistence of a firm mass. The London college gives the following directions respecting them:—

'In preparing all kinds of extracts evaporate the fluid as quickly as possible in a broad shallow dish, placed in a water-bath, until the extract acquire a consistence proper for forming pills, and towards the end of the operation stir assiduously with a spatula.

'Sprinkle a small quantity of rectified spirit upon all the softer extracts.'

Extractum aconiti. London.—Extract of aconite or wolfsbane.

Take of the fresh leaves of aconite a pound. Bruise them in a stone mortar, sprinkling over them a little water; then express the juice, and without any depuration, let the water be evaporated so that a mass is left of proper consistence.

Succus spissatus aconiti napelli. Edinburgh.—Inspissated juice of aconite.

Let the fresh leaves of aconite be bruised, and enclosed in a hempen bag; press them strongly until they yield their juice which is to be evaporated in flat vessels, heated with boiling water, saturated with common salt, and immediately reduced to the consistence of thick honey.

Medical properties.—See MATERIA MEDICA. Dose half a grain gradually increased to grs. iv. or grs. v.

Extractum aloes purificatum. London.—Extract of aloes.

Take of extract of spiked aloes powdered a pound, boiling water a gallon. Macerate for three days in a gentle heat; then strain the solution and set it aside for the dregs to subside. Pour off the clear liquor and evaporate to a due consistence.

An unnecessary preparation. Dose from gr. x. to gr. xv.

Extractum anthemidis. London.—*Extractum anthemidis nobilis.* Edinburgh.—Extract of chamomile.

Take of chamomile flowers dried a pound, water a gallon. Boil down to four pints and strain the liquor while it is hot; then evaporate to a due consistence.

The aroma and volatile oil are dissipated, and very little more than a simple bitter left by this process. Dose ℈ß. to ℈j.

Extractum belladonnæ. London.—*Succus spissatus atropæ belladonnæ.* Edinburgh.—Extract of belladonna.

Take of fresh leaves of belladonna a pound. Bruise them in a stone mortar, sprinkling over them a little water; then express the juice, and without any separation of the sediment let it be evaporated to a due consistence.

Medical properties.—Antispasmodic and sedative. Dose from gr. i. very gradually increased to grs. v. It requires great caution in its administration. As a remedy for hooping cough in conjunction with soda Dr. Thomson speaks highly of it.

Extractum cinchonæ. London.—Extract of cinchona bark.

Take of lanced-leaved cinchona bark bruised a pound, water a gallon. Boil to six pints and strain the liquor while it is warm. Boil it down again in the same manner for four times in succession in an equal quantity of water, and strain. Lastly, mix the solutions together, and evaporate the mixture to a due consistence.

This extract ought to be kept in a soft state proper for making pills, and in a hard state for reduction to powder. Dose from ℈ß to ʒß.

Extractum cinchonæ resinosum. London.—Resinous extract of bark.

Take of lanced-leaved cinchona bark bruised a pound, rectified spirits four pints. Macerate during four days, and strain. Let the tincture be distilled in a water-bath until the extract have acquired a proper consistence.

Extractum cinchonæ lancifoliæ. Edinburgh.—Extract of officinal cinchona bark.

Take of lance-leaved cinchona bark in powder one pound, alcohol four pounds. Digest for four days, and pour off the tincture. Boil the residue in five pounds of distilled water for fifteen minutes, and strain the decoction while it is hot through a linen cloth. Repeat this boiling with an equal quantity of distilled water, strain again, and evaporate the liquor to the consistence of thin honey. Distil the alcohol from the tincture until it be reduced to a similar consistence. Then mix the inspissated liquors, and evaporate them to a proper consistence in a bath of boiling water, saturated with muriate of soda.

These are preferable preparations to the watery extracts, as the active principles of the bark are better taken up by the separate action of the water and spirits than by water alone. Dose from ℈ß. to ʒß.

Extractum colocynthidis. London.—Extract of colocynth.

Take of the pulp of colocynth a pound, water a gallon. Boil down to four pints and strain the liquor while it is hot; then evaporate to a proper consistence.

Medical properties.—A mild purgative. Dose from ℈ß. to ʒß.

Extractum colocynthidis compositum. London.—Compound extract of colocynth.

Take of colocynth pulp sliced six ounces, extract of the spiked aloe powdered twelve ounces, scammony powdered four ounces, cardamom seeds powdered one ounce, hard soap three ounces, proof spirit one gallon. Let the colocynth pulp be macerated in the spirit, with a gentle heat for four days. Strain the liquor, and add the scammony, the aloes, and the soap; then evaporate it to a due consistence, and towards the end of the inspissation mix in the cardamom seeds.

Medical properties.—Combined with calomel an excellent purgative. Dose from ℈ß. to ʒß.

Extractum conii. London.—*Succus spissatus conii maculati.* Edinburgh,—Extract of hemlock.

Take of fresh hemlock a pound. Bruise it in a stone mortar, sprinkling a little water over it; then express the juice, and without separating the sediment evaporate to a proper consistence.

Medical properties.—The same as the powder. See Materia Medica. Dose gr. ii. gradually increased to ℈j.

Extractum elaterii. London.—Extract of elaterium.

Slice ripe cucumbers, express the juice very gently, and pass it through a very fine hair sieve into a glass vessel; then put it aside for some hours until the thicker part has subsided; reject the thinner supernatant part, and let the thicker part be dried with a gentle heat.

This process gives the fæcula of the plant, combined with elaterium, which, according to the experiments of Dr. Clutterbuck, is only contained in the proportion of six grains to forty of the plant, so that the pure elaterium would be very much stronger than this improperly called extract of elaterium.

Medical properties.—A most powerful and useful hydragogue. Dose from a quarter of a grain to gr. ij.

Extractum gentianæ. London.—Extract of gentian.

Take of gentian root sliced a pound, boiling water a gallon. Macerate during twenty-four hours; then boil down to four pints; let the liquor be strained while it is hot, and evaporated to a proper consistence.

Extractum gentianæ luteæ. Edinburgh.—Extract of gentian.

Take of gentian root any quantity. Having sliced and bruised it, pour eight times its weight of boiling water upon it. Boil down to one-half, express the liquor strongly, and strain it. Evaporate the decoction immediately to the consistence of thick honey in a bath of boiling water, saturated with common salt. Dose from ℈ß. to ʒß.

Extractum glycyrrhizæ. London.—Extract of liquorice.

Take of liquorice root sliced a pound, boiling water a gallon. Macerate for twenty-four hours; then boil down to four pints; let the hot solution be strained, and then evaporate to a due consistence.

What is called the refined liquorice of the shops is the impure extract of commerce dissolved and strained.

Extractum hæmatoxyli. London.—*Extractum hæmatoxyli campechianæ.* Edinburgh.—Extract of logwood.

Take of logwood rasped a pound, boiling water a gallon. Macerate for twenty-four hours; then boil to four pints, strain the hot liquor and then evaporate to a proper consistence. Dose from ℈ß. to ʒß.

Extractum radicis hellebori nigri. Edinburgh.—Extract of black hellebore root.

Prepare in the same manner as the extract of gentian.

Extractum humuli. London.—Extract of hop.

Take of the strobiles of hop four ounces, water a gallon. Boil to four pints, strain the hot liquor, and evaporate to a due consistence. Dose from ℈ß. to ℈j.

Extractum hyoscyami. London.—*Succus spissatus hyoscyami nigri.* Edinburgh.—Extract of henbane.

Take of fresh leaves of henbane a pound. Bruise them in a stone mortar, sprinkling a little water on them; then press out the juice, and without separating the sediment evaporate to a due consistence.

Medical properties.—A substitute for opium when it is desirable to avoid costiveness. Dose from gr. ij. gradually increased to ℈j.

Extractum jalapæ. London.—Extract of jalap.

Take of jalap root powdered a pound, rectified spirit four pints, water one gallon. Macerate the root in the spirit for four days, and decant the tincture. Boil the residue in the water to two pints. Then strain the tincture and decoction separately; distil the former and evaporate the latter until both begin to thicken. Lastly, mix the extract with the resin, and evaporate the liquor to a due consistence.

This extract should be preserved in a soft state fit for forming pills, and in a hard state so that it may be reduced to powder.

Extractum convolvulæ jalapæ. Edinburgh.—Extract of jalap.

This is ordered to be prepared in the same manner as the extract of cinchona. Dose from ℈ß, to ʒß.

Extractum lactucæ. London.—Extract of lettuce.

Take of fresh lettuce leaves one pound. Bruise them in a stone mortar, sprinkling over them a little water; then express the juice and evaporate it unstrained, until it acquire a due consistence.

Succus spissatus lactucæ sativæ. Edinburgh.—Inspissated juice of garden lettuce.

Succus spissatus lactucæ virosæ. Edinourgh.—Inspissated juice of the wild lettuce.

To be prepared as other inspissated juices.

Medical properties.—Substitutes for opium. Dose gr. vj. increased.

Extractum opii. London.—Extract of opium.

Take of opium sliced sixteen ounces, water one gallon. Pour upon the opium a small quantity of the water and macerate for twelve hours that it may become soft; then, gradually adding the remaining water, rub them together until they be well mixed, and set the mixture apart for the fæculencies to subside. Lastly, strain the liquor and evaporate to a due consistence. This watery solution contains less of the resinous than the gummy part of the drug, and also 'contains more of morphia on which depends the remedial quality of opium.'

Its incompatibles are 'solutions of astringent vegetables, the alkaline carbonates, corrosive muriate of mercury, sulphate of copper, sulphate of zinc, acetate of lead, and nitrate of silver.'

Medical properties.—It is said to possess the virtues without the deranging influence of opium. Dose from gr. i. to gr. v.

Extractum papaveris. London.—*Extractum papaveris somniferi.* Edinburgh.—Extract of poppies.

Take of the capsules of the poppy, freed from the seeds and bruised, a pound; boiling water a gallon. Macerate during twenty-four hours, then boil to four pints; strain the liquor while hot, and let it be evaporated to a proper consistence.

Medical properties.—Less liable to affect the head or act deleteriously than opium is. Dose grs. iij. to grs. xij.

Extractum rhæi. London.—Extract of rhubarb.

Take of powdered rhubarb root a pound, proof spirit a pint, water seven pints. Macerate in a gentle heat during four days; then strain the solution, and set it apart for the subsiding of the fæculencies. Pour off the clear liquor, and evaporate it to a due consistence. An objectionable preparation. Dose grs. x. to ʒß.

Extractum rutæ graveolentis. Edinburgh.—Extract of rue.

To be prepared in the same manner as the gentian extract.

Medical properties.—Very little more than a mere bitter. Dose from grs. xv. to ʒß.

Succus spissatus sambuci nigræ. Edinburgh.—The inspissated juice of the black elder.

Take of the ripe berries of the black elder five parts; purified sugar one part. Boil with a gentle heat to the consistence of thick honey. An apparently useless preparation.

Extractum sarsaparillæ. London.—Extract of sarsaparilla.

Take of sliced sarsaparilla root a pound; boiling water a gallon. Macerate during twenty-four hours; then boil down to four pints; strain the solution while hot, and evaporate it to a due consistence.

'It appears from Mr. Pope's experiments that by submitting the root, cut transversely, to the action of steam or distilled water, at a temperature somewhat below boiling, an elegant soluble extract may be obtained, containing all the virtues of the plant, not liable to decomposition, and applicable to the various purposes of extemporaneous prescription; whilst by the method ordered in the above formula of the college an insoluble inefficacious extract only is obtained' —Thomson. Dose from ℈ß. to ʒj.

Extractum stramonii. London.—Extract of thorn-apple.

Take of the seeds of thorn apple one pound, boiling water one gallon. Macerate during four hours in a covered vessel near the fire, then take out the seeds, bruise them in a stone mortar, and put them again into the liquor. Lastly, evaporate until the mass become of a due consistence.

Medical properties.—Narcotic, and antispasmodic. Dose from gr. ß. to grs. ij. Particularly applicable to spasmodic asthma.

Extractum taraxaci. London.—Extract of dandelion.

Take of fresh dandelion root bruised a pound, boiling water a gallon. Macerate during twenty-four hours; then boil down to four pints, strain the liquor while hot, and evaporate it to a due consistence.

Medical properties.—Deobstruent. Useful in chronic obstructions of the liver. Dose from ℈ß. to ʒj.

MISTURÆ.—Mixtures.

These, in the London college,' include what used to be called emulsions. They are to be formed extemporaneously.

Mistura ammoniaci. London.—Mixture of ammoniacum.

Take of ammoniacum two drachms; water half a pint. Triturate the ammonia gradually, adding the water until a union be thoroughly formed.

This preparation 'is coagulated by distilled vinegar, the oxymels, ether, spirit of nitric ether, supertartrate of potassa, and oxymuriate of mercury; which are, therefore, incompatible in prescription with mixture of ammoniacum.'

Medical properties.— Expectorant. Dose from f. ʒß. to f. ℥j.

Mistura amygdalarum. London.—Almond mixture.

Take of almond confection two ounces, distilled water a pint. Add the water gradually to the almond confection during trituration, and then strain.

Emulsio amygdalæ communis. Edinburgh.—Almond emulsion.

Take of sweet almonds an ounce; refined sugar half an ounce; water two pounds and a half. Let the blanched almonds be beaten diligently in a stone mortar, and the water added gradually; then strain.

Emulsio acaciæ arabicæ. Edinburgh.—Emulsion of gum arabic.

Take of mucilage of gum arabic two ounces, almonds one ounce, refined sugar half an ounce, water two pounds and a half. Blanch the almonds, and then let them be beaten in a stone mortar with the sugar and the mucilage, gradually adding the water. Then strain through linen.

'These emulsions are decomposed by acids, oxymel and syrup of squills, spirits and tinctures (unless these be in small quantities), tartrate and supertartrate of potassa, supersulphate of potassa, nitrate of potassa, oxymuriate of mercury, acetate of lead, and spirit of nitric ether, which are therefore incompatible in prescriptions with almond emulsions.'

Medical properties.—Demulcent and diluent. Dose f. ℥ij.

Mistura assafœtidæ.—Mixture of assafœtida.

Take of assafœtida two drachms, water half a pint. Triturate the assafœtida, adding gradually the water to it until a thorough union be formed.

Medical properties.—Antispasmodic. Used principally in enemas. Dose when taken into the stomach from f. ʒß. to f. ℥iß.

Mistura camphoræ. London.—Mixture of camphor.

Take of camphor half a drachm, rectified spirits ten minims; water a pint. Rub the camphor with the spirit first, then gradually add the water; strain. Dose from f. ℥ß. to ℥ij.

Emulsio camphoræ. Edinburgh.—Camphor emulsion.

Take of camphor a scruple; sweet almonds blanched, refined sugar, of each half an ounce; water a pint and a half. To be made in the same manner as the common almond emulsion.

A more powerful, and therefore better preparation than that of the London college. Dose from f. ℥ß. to f. ℥ij.

Mistura cornu usti. London.—Mixture of burnt hartshorn.

Take of burnt hartshorn two ounces; acacia gum, in powder, one ounce; water three pints. Boil down to two pints, continually stirring, and strain. A useless preparation.

Mistura cretæ. London.—Mixture of chalk.

Take of prepared chalk half an ounce; refined sugar three drachms; acacia gum, in powder, half an ounce; water a pint. Mix by triturating.

Potio carbonatis calcis. Edinburgh.—Chalk potion.

Take of prepared carbonate of lime (chalk) one ounce, refined sugar half an ounce, mucilage of gum arabic two ounces. Rub them together, gradually adding of water two pounds and a half, spirit of cinnamon two ounces. Mix.

Medical properties.—Antăcid, and astringent. Dose from f. ℥j. to f. ℥ij.

Mistura ferri composita. London.—Compound mixture of iron.

Take of myrrh, powdered, a drachm; subcarbonate of potassa twenty-five grains; rose-water seven fluid ounces and a half; sulphate of iron, in powder, a scruple; spirit of nutmeg half a fluid ounce; refined sugar a drachm. Rub the myrrh, the subcarbonate of potassa, and the sugar together; and, during trituration, add first the rose-water and the spirit of nutmeg, and afterwards the sulphate of iron. Put the mixture immediately into a proper glass vessel, and keep it closely stopped.

In this preparation a sulphate of potassa is formed, and a subcarbonate of iron, the last of which is not dissolved, but merely diffused and suspended.

Medical properties.—Tonic and deobstruent. Dose from f. ℥ß to f. ℥ij.

Mistura guaiaci. London.—Mixture of guaiacum.

Take of guaiacum a drachm and a half, refined sugar two drachms, mucilage of gum acacia two fluid drachms, cinnamon water eight fluid ounces. Rub the guaiacum with the sugar, then with the mucilage, and while triturating gradually add the cinnamon water. Dose from ʒß to f. ʒij.

Mistura moschi. London.—Mixture of musk.

Take of musk, acacia gum in powder, refined sugar, of each a drachm; rose water six fluid ounces. Rub the musk first with the sugar, then with the gum, and gradually add the rose water.

Medical properties.—Antispasmodic, and stimulant. Dose from f. ℥ß. to f. ℥ij.

Spiritus.—Spirits.

Alcohol. London. See Chemistry.

Spiritus ammoniæ. London.—Spirit of ammonia.

Take of rectified spirit three pints, muriate of ammonia four ounces, subcarbonate of potassa six ounces. Mix them, and distil with a gentle heat a pint and a half of spirit of ammonia into a receiver which is kept cold.

Alcohol ammoniatum. Edinburgh.—Ammoniated alcohol.

Take of alcohol thirty-two ounces, lime recently burnt twelve ounces, muriate of ammonia eight ounces, water six ounces. From these ammoniated alcohol is to be prepared precisely in the same manner as water of ammonia.

The decompositions in the above processes are sufficiently obvious.

Spiritus ammoniæ aromaticus. London.—Aromatic spirit of ammonia.

Take of bark of cinnamon bruised, cloves bruised, of each two drachms, lemon peel four ounces, subcarbonate of potassa half a pound, muriate of ammonia five ounces, rectified spirit four pints, water a gallon. Mix them, and distil over six pints.

Alcohol ammoniatum aromaticum. Edinburgh.—Aromatic ammoniated tincture.

Take of ammoniated alcohol eight ounces, volatile oil of rosemary a drachm and a half, volatile oil of lemons a drachm. Mix them so as that the oils shall be dissolved.

Medical properties.—Stimulant, and aromatic. Dose from f. ʒß to f. ʒj.

Spiritus ammoniæ fœtidus. London.—Fetid spirit of ammonia.

Take of spirit of ammonia two pints, assafœtida two ounces. Macerate during twelve hours; then by a gentle fire distil over one pint and a half into a cold receiver.

Tinctura assafœtidæ ammoniata. Edinburgh.—Ammoniated tincture of assafœtida.

Take of ammoniated alcohol eight ounces, assafœtida half an ounce. Digest in a close vessel during twelve hours, then distil over eight ounces by the heat of boiling water.

Medical properties, and dose, the same as the preceding.

Spiritus ammoniæ succinatus. London. Succinated spirit of ammonia.

Take of mastich three drachms, alcohol nine fluid ounces, oil of lavender fourteen minims, oil of amber four minims, solution of ammonia ten fluid ounces. Macerate the mastich in the alcohol so as to dissolve it, and pour off the clear tincture; then add the other ingredients, and mix them by agitation.

Medical properties.—Stimulant and antispasmodic. Dose from ♏x. to f. ʒß. It has been successfully used as an antidote to the bite of the rattle snake.

Spiritus anisi. London.—Spirit of aniseed.

Take of bruised aniseeds half a pound, proof spirit a gallon, water sufficient to prevent empyreuma. Distil one gallon.

Medical properties.—Carminative. Dose from f. ʒj. to f. ℥ß.

Spiritus armoraciæ compositus. London.—Compound spirit of horse radish.

Take of fresh horse radish sliced, orange peel dried, of each a pound; nutmegs bruised half an ounce; proof spirit a gallon; water sufficient to prevent empyreuma. Macerate during twenty-four hours, and distil over a gallon by a gentle heat.

Medical properties.—Principally employed in dropsies. Dose f. ʒj. to f. ℥ß.

Spiritus camphoræ. London.—Spirit of camphor.

Take of camphor four ounces, rectified spirit two pints. Mix so as to dissolve the camphor.

Tinctura camphoræ. Edinburgh.—Tincture of camphor.

Take of camphor one ounce, alcohol a pound. Mix so as to dissolve the camphor. It may be made with double or treble the quantity of camphor.

Medical properties.—Only fit for external use.

Spiritus carui. London.—Spirit of carraway.

Take of carraway seeds bruised a pound and a half, proof spirit a gallon, water sufficient to prevent empyreuma. Macerate during twenty-four hours; then distil over a gallon by a gentle fire.

Spiritus cari carui. Edinburgh.—Spirit of carraway.

Take of carraway seeds bruised half a pound, proof spirit nine pounds. Macerate in a close vessel during two days; then add water sufficient to prevent empyreuma, and distil over nine pounds.

Medical properties.—Carminative. Dose from f. ʒj. to f. ʒij.

Spiritus cinnamomi. London.—Spirit of cinnamon.

Take of oil of cinnamon by weight five scruples, rectified spirit four pints and a half. Add the spirit to the oil with the addition of so much water as will be sufficient to prevent empyreuma; then distil a gallon over by a slow fire.

Spiritus lauri cinnamomi. Edinburgh.—Spirit of cinnamon.

To be prepared in the same manner as the spirit of carraway: using a pound of cinnamon bark.

Medical properties.—Cardiac. Dose f. ʒj. to ʒij.

Spiritus colchici ammoniatus. London.—Ammoniated spirit of colchicum.

Take of colchicum seeds bruised two ounces, aromatic spirit of ammonia a pint. Macerate for fourteen days, and strain.

Medical properties.—Dr. Williams of Ipswich suggested the use of the seeds of colchicum as containing the virtues without the deleterious qualities of the plant. Others have questioned their power. Dose of this preparation f. ʒj.

Spiritus juniperi compositus. London. Edinburgh.—Compound spirit of juniper.

Take of juniper berries bruised a pound, carraway seeds bruised, fennel seeds bruised, of each an ounce and a half, proof spirit a gallon, water a sufficient quantity to prevent empyreuma. Macerate during twenty-four hours; then distil over a gallon by a gentle heat.

Medical properties.—Diuretic. Dose f. ʒj. to f. ℥ß.

Spiritus lavandulæ. London.—Spirit of lavender.

Take of fresh lavender flowers two pounds, rectified spirit a gallon, water sufficient to prevent empyreuma. Macerate during twenty-four hours; then distil over a gallon by a gentle heat.

Spiritus lavandulæ spicæ. Edinburgh.—Spirit of lavender.

Take of fresh flowers of lavender two pounds, alcohol eight pounds. Distil over seven pounds with the heat of a water-bath.

Principally employed as a perfume.

Spiritus lavandulæ compositus. London.—Compound spirit of lavender.

Take of spirit of lavender three pints, spirit of rosemary a pint, cinnamon bark bruised, nutmegs bruised, of each half an ounce, red saunders wood chipped one ounce. Macerate during fourteen days, and strain.

Edinburgh.—Take of spirit of lavender three pounds, spirit of rosemary one pound, cinnamon bark bruised one ounce, nutmegs bruised six drachms, red saunders wood rasped three drachms. Macerate during seven days, and strain.

Medical properties.—Stimulant and aromatic. Dose from f. ʒß. to f. ʒij.

Spiritus menthæ piperitæ. London. Edinburgh. Spirit of peppermint.

Take of dried peppermint a pound and a half, proof spirit a gallon, water a sufficient quantity to prevent empyreuma. Macerate during twenty-four hours; then distil over a gallon by a gentle heat.

Medical properties.—Carminative. Dose f. ʒj. to f. ʒij.

Spiritus menthæ viridis. London.—Spirit of spearmint.

Take of spearmint dried a pound and a half, proof spirit a gallon, water sufficient to prevent empyreuma. Macerate during twenty-four hours; then by a gentle heat distil over a gallon.

Medical properties.—Like the last.

Spiritus myristicæ. London.—*Spiritus myristicæ moschatæ.* Edinburgh.—Spirit of nutmeg.

Take of nutmegs bruised two ounces, proof spirit a gallon, water sufficient to prevent empyreuma. Macerate during twenty-four hours; then distil a gallon by a gentle heat.

Spiritus pimentæ. London.—Spirit of pimento.

Take of pimento berries bruised two ounces, proof spirit a gallon, water a sufficient quantity to prevent empyreuma. Macerate during twenty-four hours; then by a gentle heat distil over a gallon.

Spiritus myrti pimentæ. Edinburgh. Spirit of pimenta.

To be prepared with half a pound of bruised pimento berries in the same manner as the carraway spirit.

Medical properties.—Carminative. Dose f. ʒj.

Spiritus pulegii. London.—Spirit of pennyroyal.

Take of pennyroyal dried a pound and a half, proof spirit a gallon, water sufficient to prevent empyreuma. Macerate during twenty-four hours; then, by a gentle fire, distil over a gallon.

Medical properties.—Like spearmint.

Spiritus rosmarini. London.—Spirit of rosemary.

Take of fresh rosemary tops two pounds, proof spirit a gallon, water sufficient to prevent empyreuma. Macerate during twenty-four hours; then distil a gallon with a gentle heat.

Spiritus rorismarini officinalis. Edinburgh.—Spirit of rosemary.

Take of fresh rosemary tops two pounds, alcohol eight pounds. Draw off by distillation in a water-bath seven pounds.

TINCTURÆ.—Tinctures.

Tinctura aloes. London.—Tincture of aloes.

Take of extract of spiked aloes powdered half an ounce, extract of liquorice an ounce and a half, water a pint, rectified spirit four fluid ounces. Macerate in a sand-bath until the extracts be dissolved; then strain.

Tinctura aloes socotorinæ. Edinburgh.—Tincture of socotorine aloes.

Take of socotorine aloes in powder half an ounce, extract of liquorice one ounce and a half, alcohol four ounces, water a pound. Digest during seven days with a gentle heat in a close vessel, which is to be shaken frequently (a circumstance to be attended to in the preparation of tinctures generally); then pour off the clear tincture. Dose from f. ℥ß. to f. ℥iß.

Tinctura aloesætherea. Edinburgh.—Etherial tincture of aloes.

Take of socotorine aloes, myrrh, of each powdered an ounce and a half, English saffron cut one ounce, sulphuric ether with alcohol one pound. Digest the myrrh for four days with the ether in a closed bottle; then add the saffron, and the aloes. Again digest for four days; and, when the dregs have subsided, let the tincture be poured off.

Medical properties.—Stimulant and stomachic. Dose f. ʒij. to f. ʒiij.

Tinctura aloes composita. London.—Compound tincture of aloes.

Take of extract of spiked aloes, powdered saffron, of each three ounces, tincture of myrrh two pints. Macerate during fourteen days, and strain.

Tinctura aloes et myrrhæ. Edinburgh.—Tincture of aloes and myrrh.

Take of myrrh in powder two ounces, alcohol a pound and a half, water half a pound. Mix the alcohol with the water; then add the myrrh. Digest during four days; and lastly add of socotorine aloes in powder one ounce and a half, English saffron cut in pieces one ounce. Digest again during three days, and pour off the clear tincture. Dose from f. ʒj. to f. ʒiij.

Tinctura assafœtidæ. London.—Tincture of assafœtida.

Take of assafœtida four ounces, rectified spirit of wine two pints, water eight fluid ounces. Add the spirit to the assafœtida previously triturated with water; then digest during seven days, and strain.

Tinctura assafœtidæ. Edinburgh.—Tincture of assafœtida.

Take of assafœtida four ounces, alcohol two pounds and a half. Digest during seven days, and filter through paper. Dose from f. ʒj. to f. ʒiij.

Tinctura aurantii. London.—Tincture of orange peel.

Take of fresh orange peel three ounces, proof spirit two pints. Macerate during fourteen days, and filter. Dose from f. ʒj. to f. ʒij.

Tinctura benzoini composita. London.—Compound tincture of benzoin.

Take of benzoin three ounces, storax balsam strained two ounces, tolu balsam one ounce, extract of spiked aloes half an ounce, rectified spirit two pints. Macerate during fourteen days, and filter.

Tinctura benzoini composita. Edinburgh.—Compound tincture of benzoin.

Take of benzoin in powder three ounces, balsam of Peru two ounces, hepatic aloes powdered half an ounce, alcohol two pounds. Digest during seven days, and filter through paper.

Medical properties.—Expectorant. Dose from f. ʒj. to f. ʒij.

Tinctura bonplandiæ trifoliata. Edinburgh.—Tincture of bonplandia, or augustina.

Take of the bark of trifoliate bonplandia bruised two ounces, proof spirit two pounds and a half. Digest during seven days, and filter through paper. Dose f. ʒj. to f. ʒij.

Tinctura calumbæ. London.—Tincture of calumba.

Take of sliced calumba root two ounces and a half, proof spirit two pints. Macerate during fourteen days, and filter.

Tinctura colombæ. Edinburgh.—Tincture of calumba.

Take of columba root in powder two ounces, proof spirit two pounds. Digest during seven days, and filter through paper. Dose f. ʒj. to f. ℥ß.

Tinctura camphoræ composita. London.—Compound tincture of camphor.

Take of camphor two scruples; hard opium powdered, acid of benzoin, of each one drachm; proof spirit two pints. Macerate during fourteen days, and filter.

Tinctura opii camphorata sive elixir paregoricum Anglorum. Edinburgh.—Camphorated tincture of opium or paregoric elixir.

Take of camphor two scruples; hard purified opium powdered, benzoic acid, of each a drachm; proof spirit two pints. Digest during seven days, and filter.

Medical properties.—Anodyne and expectorant, after inflammatory symptoms have somewhat subsided. Dose from f. ʒß. to f. ʒij.

Tinctura cantharidis. London.—Tincture of blistering fly.

Take of blistering flies bruised three drachms, proof spirit two pints. Macerate during fourteen days, and filter.

Tinctura cantharidis vesicatoriæ. Edinburgh.—Tincture of blistering-fly

Take of blistering-flies bruised a drachm, proof spirit a pound. Digest for seven days, and filter through paper.

Medical properties.—Stimulant: useful in gleets and leucorrhœa. Dose from ♏x. to f. ʒj.

Tinctura capsici. London.—Tincture of capsicum.

Take of capsicum berries one ounce, proof spirit two pints. Macerate during fourteen days, and filter.

Medical properties.—Stimulant. Dose from ♏xij. to f. ʒß: f. ʒij. to a pint of water for a gargle.

Tinctura cardamomi. London.—Tincture of cardamoms.

Take of cardamom seeds husked and bruised three ounces, proof spirit two pints. Macerate during fourteen days, and filter.

Tinctura amomi repentis. Edinburgh.—Tincture of cardamoms.

Take of lesser cardamom seeds bruised four ounces, proof spirit two pounds and a half. Digest during seven days, and filter through paper.

Tinctura cardamomi composita. London.—Compound tincture of cardamoms.

Take of cardamom seeds, carraway seeds, cochineal, of each powdered two drachms, cinnamon bark bruised half an ounce, raisins stoned four ounces, proof spirit two pints. Macerate during fourteen days, and filter.

Medical properties.—Cordial. Dose f. ʒij.

Tinctura cascarillæ. London.—Tincture of cascarilla.

Take of cascarilla bark powdered four ounces, proof spirit two pints. Macerate during fourteen days, and filter.

Tinctura crotonis eleutheriæ. Edinburgh.—Tincture of croton eleutheria or cascarilla.

Take of croton eleutheria bruised four ounces, proof spirit two pounds and a half. Digest during seven days, and filter through paper. Scarcely at all used.

Tinctura castorei. London.—Tincture of castor.

Take of castor powdered two ounces, rectified spirit two pints. Macerate during seven days, and filter.

Edinburgh.—Take of castor powdered an ounce and a half, alcohol a pound. Macerate during seven days, and filter through paper.

Tinctura castorei composita. Edinburgh.—Compound tincture of castor.

Take of Russian castor in powder one ounce, assafœtida half an ounce, ammoniated alcohol one pound. Digest during seven days, and filter through paper.

Medical properties.—These tinctures are given in drachm and two drachm doses, in hysteria and spasmodic flatulencies.

Tinctura catechu. London.—Tincture of catechu.

Take of extract of catechu three ounces, cinnamon bark bruised two ounces, proof spirit two pints. Macerate during fourteen days, and filter.

Tinctura catechu acaciæ. Edinburgh.—Tincture of catechu.

Take of extract of catechu powdered three ounces, cinnamon bark bruised two ounces, proof spirit two pounds and a half. Digest during seven days, and filter through paper. Dose f. ʒj. to f. ʒiij.

Tinctura cinchonæ. London.—Tincture of cinchona.

Take of lance-leaved cinchona bark powdered seven ounces, proof spirit two pints. Macerate for fourteen days, and filter.

Tinctura cinchonæ. Edinburgh.—Tincture of cinchona.

Take of cinchona bark powdered four ounces, proof spirit two pounds and a half. Digest during seven days, and filter through paper. Dose from f. ʒij. to f. ℥ß.

Tinctura cinchonæ ammoniata. London.—Ammoniated tincture of cinchona.

Take of lance-leaved cinchona bark in powder four ounces, aromatic spirit of ammonia two pints. Macerate during two days, and filter. Dose f. ʒij. to f. ʒiij.

Tinctura cinchonæ composita. London.—Compound tincture of cinchona.

Take of lance-leaved cinchona bark in powder two ounces, dried orange peel one ounce and a half, virginian snake root bruised three drachms, saffron a drachm, cochineal powdered two scruples, proof spirit twenty fluid ounces. Macerate during fourteen days, and filter.

Huxham's tincture. Dose from f. ʒj. to f. ℥ß.

Tinctura cinnamomi. London.—*Tinctura lauri cinnamomi.* Edinburgh.—Tincture of cinnamon.

Take of cinnamon bark bruised three ounces, proof spirit two pints. Macerate during fourteen days, and filter. Dose from f. ʒj. to f. ʒiij.

Tinctura cinnamomi composita. London.—Compound tincture of cinnamon.

Take of cinnamon bark bruised six drachms, cardamom seeds bruised three drachms, long pepper powdered, ginger root sliced, of each two drachms, proof spirit two pints. Macerate during fourteen days, and filter.

Tinctura cinnamomi composita. Edinburgh.—Compound tincture of cinnamon.

Take of cinnamon bark bruised, lesser cardamom seeds bruised, of each one ounce; long pepper in powder two drachms; proof spirit two pounds and a half. Digest during seven days, and filter through paper. Dose f. ʒj. to f. ʒiij.

Tinctura conii maculati. Edinburgh.—Tincture of hemlock.

Take of dried leaves of hemlock two ounces, cardamom seeds bruised half an ounce, proof spirit sixteen ounces. Digest during seven days, and filter through paper. Dose f. ʒß.

Tinctura croci sativi. Edinburgh.—Tincture of saffron.

Take of English saffron cut in shreds an ounce, proof spirit fifteen ounces. Digest for seven days, and filter through paper. Nearly inert. Used for its color.

Tinctura digitalis. London.—Tincture of foxglove.

Take of foxglove leaves dried four ounces, proof spirit two pints. Macerate during fourteen days, and filter.

Tinctura digitalis purpureæ. Edinburgh.—Tincture of foxglove.

Take of foxglove leaves dried one ounce, proof spirit eight ounces. Digest during seven days, and filter through paper. Dose ♏x., gradually, but carefully, increased to a f. ʒj.

Tinctura gallarum. Edinburgh.—Tincture of galls.

Take of galls powdered two ounces, proof spirit sixteen ounces. Macerate during seven days, then filter through paper. Dose f. ʒj. to f. ʒiij.

Tinctura gentianæ composita. London.—Compound tincture of gentian.

Take of gentian root cut two ounces, orange peel dried one ounce, cardamom seeds bruised half an ounce, proof spirit two pints. Macerate during fourteen days, and filter.

Tinctura gentianæ composita. Edinburgh.—Compound tincture of gentian.

Take of yellow gentian root sliced and bruised two ounces, orange peel dried and bruised one ounce, canella alba bruised half an ounce, cochineal in powder half a drachm, proof spirit two pints and a half. Digest during seven days, and filter through paper. Dose f. ʒij. to ℥ß.

Tinctura guaiaci. London.—Tincture of guaiacum.

Take of guaiacum powdered half a pound,

proof spirit two pints. Macerate during fourteen days and filter.

Tinctura guaiaci officinalis. Edinburgh.—Tincture of guaiacum.

Take of guaiacum in powder six ounces, alcohol two pounds and a half. Digest during seven days, and filter through paper. Dose f. ʒj. to ʒiij.

Tinctura guaiaci ammoniata. London. Edinburgh.—Ammoniated tincture of guaiacum.

Take of guaiacum in powder four ounces, aromatic spirit of ammonia one pint and a half. Macerate during fourteen (seven days Edinburgh), and filter. A good preparation. Dose f. ʒj. to f. ʒij.

Tinctura hellebori nigri. London.—Tincture of black hellebore.

Take of the root of black hellebore sliced four ounces, proof spirit two pints. Macerate during fourteen days, and filter.

Edinburgh.—Take of black hellebore root bruised two ounces, cochineal in powder fifteen grains, proof spirit fifteen ounces. Digest during seven days; then filter through paper.

Medical properties.—Emmenagogue. Dose from f. ʒß. to ʒj.

Tinctura humuli. London. Edinburgh.—Tincture of hops.

Take of hops five ounces, proof spirit two pints. Macerate during fourteen days, and strain seven days. Let the tincture be expressed, and filtered through paper.

Medical properties.—Efficacy doubtful. Dose f. ʒj. to ʒij.

Tinctura hyoscyami. London.—Tincture of henbane.

Take of the dried leaves of henbane four ounces, proof spirit two pints. Macerate during fourteen days, and filter.

Tinctura hyoscyami nigri. Edinburgh.—Tincture of black henbane.

Take of the dried leaves of black henbane an ounce, proof spirit eight ounces. Digest during seven days, and filter through paper. Substitute for opium. Dose ♏xv. to f. ʒj.

Tinctura jalapæ. London.—Tincture of jalap.

Take of jalap root powdered eight ounces, proof spirit two pints. Digest during fourteen days, and filter.

Tinctura convolvuli jalapæ. Edinburgh.—Tincture of jalap.

Take of jalap root in powder three ounces, proof spirit fifteen ounces. Digest during seven days, and filter through paper. Dose f. ʒj. to f. ʒiij.

Tinctura kino. London.—Tincture of kino.

Take of kino in powder three ounces, proof spirit two pints. Macerate during fourteen days and strain. Dose from f. ʒj. to f. ʒij.

Tinctura myrrhæ. London.—Tincture of myrrh.

Take of myrrh bruised four ounces, rectified spirit three pints. Macerate during fourteen days, and filter.

Edinburgh.—Take of myrrh in powder three ounces, alcohol twenty ounces, water ten ounces. Digest during seven days, and filter through paper. Principally employed as a wash to the mouth in cases of spongy gums.

Tinctura opii. London.—Tincture of opium.

Take of hard opium powdered two ounces and a half, proof spirit two pints. Macerate during fourteen days, and strain.

Tinctura opii. Edinburgh.—Tincture of opium, commonly called liquid laudanum.

Take of opium two ounces, proof spirit two pounds. Macerate during twelve days, and filter through paper. Dose from ♏vj. to f. ʒj. or more.

Tinctura opii ammoniata. Edinburgh.—Olim Elixir paregoricum. Ammoniated tincture of opium.

Take of opium two drachms, Benzoic acid, saffron cut in shreds, of each three drachms; volatile oil of aniseed half a drachm; ammoniated alcohol sixteen ounces. Digest during seven days, and filter through paper. Dose from f. ʒß. to ʒj.

Tinctura quassiæ excelsæ. Edinburgh.—Tincture of quassia.

Take of quassia wood rasped one ounce, proof spirit two pounds and a half. Digest during seven days, and filter through paper. Dose f. ʒij.

Tinctura rhæi. London.—Tincture of rhubarb.

Take of rhubarb root sliced two ounces, cardamom seeds bruised one ounce and a half, saffron two drachms, proof spirit two pints. Macerate during fourteen days in a gentle heat, and filter.

Tinctura rhæi. Edinburgh.—Tincture of rhubarb.

Take of rhubarb sliced three ounces, lesser cardamom seeds bruised half an ounce, proof spirit two pounds and a half. Digest during seven days, and filter through paper.

Tinctura rhæi composita. London.—Compound tincture of rhubarb.

Take of rhubarb root sliced two ounces, liquorice root bruised half an ounce, ginger root sliced, saffron, of each two drachms, proof spirit a pint, water twelve fluid ounces. Macerate with a gentle heat during fourteen days, and filter.

Tinctura rhæi et aloes. Edinburgh.—Tincture of rhubarb and aloes. Formerly sacred elixir.

Take of rhubarb root sliced ten drachms, socotorine aloes powdered six drachms, lesser cardamom seeds bruised half an ounce, proof spirit two pounds and a half. Digest during seven days, and filter through paper.

Tinctura rhæi et gentianæ. Edinburgh.—Tincture of rhubarb and gentian.

Take of rhubarb root sliced two ounces, gentian root sliced half an ounce, proof spirit two pounds and a half. Digest during seven days, and filter through paper. Dose of the above tinctures, as a purgative, from f. ℥ß. to ℥j.; for a stomachic, f. ʒj. to f. ʒiij.

Tinctura scillæ. London. Edinburgh.—Tincture of squills.

Take of recent squill root four ounces (two ounces Edinburgh), proof spirit two pints (sixteen ounces Edinburgh). Macerate during fourteen days, and filter. Dose from ♏xv. to f. ʒß.

Tinctura sennæ. London.—Tincture of senna.

Take of senna leaves three ounces, carraway seeds bruised three drachms, cardamom seeds bruised a drachm, stoned raisins four ounces, proof spirit two pints. Macerate with a gentle heat during fourteen days, and filter.

Tinctura sennæ composita. Edinburgh —Compound tincture of senna.

Take of the leaves of senna two ounces, jalap bruised one ounce, coriander seeds bruised half an ounce, proof spirit three pounds and a half. Digest during seven days, and add four ounces of refined sugar to the tincture when filtered. Dose from f. ʒij. to f. ʒvj.

Tinctura serpentariæ. London.—Tincture of snake root.

Take of snake root three ounces, proof spirit two pints. Macerate during fourteen days, and filter.

Tinctura aristolochiæ serpentariæ. Edinburgh. Tincture of snake root.

Take of snake root bruised two ounces, cochineal in powder a drachm, proof spirit two pounds and a half. Digest during seven days, and filter through paper. Dose from f. ʒß. to f. ʒij.

Tinctura toluiferæ balsami. Edinburgh.—Tincture of tolu.

Take of balsam of tolu one ounce and a half, alcohol a pound. Digest until the balsam be dissolved, and filter through paper. Very little used.

Tinctura valerianæ. London.—Tincture of valerian.

Take of valerian root in powder four ounces, proof spirit two pints. Macerate during fourteen days, and filter. Dose f. ʒj. to f. ʒij.

Tinctura valerianæ ammoniata. London.—Ammoniated tincture of valerian.

Take of valerian root four ounces, aromatic spirit of ammonia two pints. Macerate during fourteen days, and filter. Dose f. ʒj.

Tinctura veratri albi. Edinburgh.—Tincture of white hellebore.

Take of white hellebore root bruised eight ounces, proof spirit one pound and a half. Digest during seven days, and filter through paper. But little used. Dose ♏v to ♏x.

Tinctura zingiberis. London. *Tinctura amomi zingiberis.* Edinburgh.—Tincture of ginger.

Take of ginger root sliced two ounces, rectified spirit two pints. Macerate during fourteen days (seven days Edinburgh), and filter. Dose f. ʒj. to ʒij.

ÆTHEREA.—Preparations of ether.

Æther sulphuricus.—Sulphuric ether.

For the modes of preparing sulphuric ether, and the theory of its composition, see CHEMISTRY.

Spiritus ætheris aromaticus. London.—Aromatic spirit of ether

Take of cinnamon bark bruised three drachms, cardamom seeds powdered a drachm and a half, long pepper powdered, ginger root sliced, of each a drachm, spirit of sulphuric ether a pint. Macerate during fourteen days in a stopped glass bottle, and strain.

Æther sulphuricus cum alcoholi aromaticus. Edinburgh.—Aromatic sulphuric ether with alcohol.

Take of cinnamon bark bruised, cardamom seeds bruised, each an ounce; long pepper bruised two drachms; sulphuric ether with alcohol two pounds and a half. Digest during seven days, and filter through paper.

Spiritus ætheris nitrici. London.—Spirit of nitric ether.

Take of rectified spirit two pints, nitric acid (by weight) three ounces. Add the acid gradually to the spirit, and mix them, taking care that the temperature during the mixture does not exceed 120°; then distil over by a gentle heat twenty-four fluid ounces.

Spiritus ætheris nitrosi. Edinburgh.—Spirit of nitrous ether.

Take of alcohol three pounds, nitrous acid one pound. Pour the alcohol into a large phial placed in a vessel filled with cold water, and gradually add the acid with frequent agitation. Let the phial be slightly corked, and placed in a cool place during seven days; then distil the liquor by the heat of boiling water, into a receiver kept cool with snow or water, so long as any spirit comes over.

Medical properties.—Refrigerant, diuretic, and antispasmodic. Dose from f. ʒß. to f. ʒj.

Spiritus ætheris sulphurici. London.—Spirit of sulphuric ether.

Take of sulphuric ether half a pint, rectified spirit a pint. Mix them.

Æther sulphuricus cum alcohole. Edinburgh.—Sulphuric ether with alcohol.

Take of sulphuric ether one part, alcohol two parts. Mix them.

Medical properties.—Stimulant, antispasmodic, and narcotic. Dose of the ether itself from f. ʒß. to f. ʒij., of the spirit from f. ʒj. to f. ʒiij.

Spiritus ætheris sulphurici compositus. London.—Compound spirit of ether.

Take of spirit of sulphuric ether a pint, ethereal oil two fluid drachms. Mix. A substitute for Hoffman's anodyne. Dose from f. ʒß. to f. ʒij.

VINA.—Wines.

Vinum aloes. London.—Wine of aloes.

Take of extract of spiked aloes eight ounces, canella bark two ounces, proof spirit, distilled water, of each four pints. Rub the extract to powder with white sand previously freed from impurities; rub also the canella bark into powder, and on these mixed together let the water and spirits be poured; then digest with frequent agitation, during fourteen days, and strain.

Vinum aloes socotorinæ. Edinburgh.—Wine of socotorine aloes.

Take of socotorine aloes in powder one ounce, lesser cardamom seeds bruised, ginger root bruised, of each a drachm, Spanish white wine two pounds. Digest for seven days, agitating the mixture frequently and strain. The formula of the London college is absurdly termed a wine.

Medical properties.—Stomachic and purgative. Dose from f. ʒj. to f. ʒiij. for the first intention, from f. ℥ß. to f. ℥iß. for the second.

Vinum colchici. London.—Wine of colchicum.

Take of the fresh root of colchicum bruised two ounces, proof spirit twelve fluid ounces, distilled water twenty fluid ounces. Macerate during fourteen days, and filter. Sherry wine is a better solvent for the colchicum than spirit. (Thomson).

Medical properties.—Sedative, purgative, and antiartharitic. Dose from ♏xv. to f. ʒj.: in increasing its dose its effects should be carefully watched.

Vinum gentianæ compositum. Edinburgh.—Compound wine of gentian.

Take of gentian root half an ounce, cinchona bark one ounce, orange peel dried two drachms, canella one drachm, proof spirit four ounces, Spanish white wine two pounds and a half. Pour first the proof spirit on the root and the bark sliced and bruised, and at the end of twenty-four hours add the wine; then macerate during seven days, and strain. Dose f. ʒß.

Vinum ipecacuanhæ. London.—Wine of ipecacuanha.

Take of ipecacuanha root bruised two ounces, proof spirit twelve fluid ounces, distilled water twenty fluid ounces. Macerate during fourteen days, and filter.

Edinburgh.—Take of the root of ipecacuanha bruised two ounces, Spanish white wine two pints. Digest during seven days, then filter. Dose as an emetic from f. ʒij. to f. ℥j. for an adult. As an expectorant, &c., ♏xij. to f. ʒß.

Vinum nicotianæ tabaci. Edinburgh.—Wine of tobacco.

Take of tobacco leaves one part, Spanish white wine twelve parts. Macerate during seven days, and filter through paper.

Medical properties.—Diuretic and antispasmodic. Dose from ♏x. to f. ʒß.

Vinum opii. London. Edinburgh.—Wine of opium.

Take of extract of opium an ounce, cinnamon bark bruised, clove bruised, of each a drachm, proof spirit six fluid ounces, distilled water ten fluid ounces. Macerate during eight days (seven Edinburgh), and filter.

Medical properties.—Useful where opium in substance or mere tincture is objectionable. Dose ♏xij. to f. ʒß. or ʒj.

Vinum rhæi. Edinburgh.—Wine of rhubarb.

Take of sliced rhubarb root two ounces, canella bark bruised a drachm, proof spirit two ounces, Spanish white wine fifteen ounces. Macerate during seven days, and filter through paper. Dose from f. ℥ß. to f. ℥iß.

Vinum veratri. London.—Wine of white hellebore.

Take of white hellebore root bruised eight ounces, proof spirit a pint, distilled water a pint and a half. Macerate during fourteen days, and filter. Seldom employed. Dose ♏x. to f. ʒß.

Acetica.—Preparations with vinegar.

Acidum aceticum aromaticum. Edinburgh.—Aromatic vinegar.

Take of rosemary tops dried, sage leaves dried, of each one ounce; lavender flowers dried half an ounce; cloves bruised half a drachm; distilled vinegar two pounds. Macerate during seven days, and filter the expressed liquor through paper.

Medical properties.—Chiefly employed to correct the odor of sick rooms. Dose internally as a stimulant from f. ʒß. to f. ʒj.

Acidum aceticum camphoratum. Edinburgh.—Camphorated acetic acid.

Take of acetic acid six ounces, camphor half an ounce. Rub the camphor to powder by the assistance of a small quantity of alcohol; then dissolve it in the acid.

Medical properties.—Snuffed up the nostrils in faintings and languors.

Acetum colchici. London.—Vinegar of meadow saffron (colchicum).

Take of fresh meadow saffron root sliced an ounce, distilled vinegar a pint, proof spirit a fluid ounce. Macerate the meadow saffron root with the vinegar in a covered glass vessel during twenty-four hours; then express, and set the liquor aside for the subsidence of the fæculencies. Lastly, add the spirit to the clear liquor.

Medical properties.—Diuretic, sedative, and antiarthritic. Dose from f. ʒß. to f. ʒj.

Acetum scillæ. London.—Vinegar of squill.

Take of fresh squill root dried a pound, distilled vinegar six pints, proof spirit half a pint. Macerate the squill root in the vinegar with a gentle heat and in a covered vessel during twenty-four hours; then express the liquor, and set it aside for the subsidence of the fæculencies. Lastly add the spirit to the clear liquor.

Acidum aceticum scilliticum. Edinburgh.—Vinegar of squill.

Take of squill root dried one ounce, distilled vinegar fifteen ounces, alcohol one ounce and a half. Macerate the squill with the acid during seven days; then express the liquor, and add the alcohol to it. When the fæculencies have subsided pour off the clear liquor. Dose from f. ʒß. to f. ʒij.

Mellita.—Preparations with honey.

Mel dispumatum. London.—Clarified honey.

Melt the honey in a water-bath; then separate the scum.

Mel boracis. London.—Honey of borax.

Take of subborate of soda powdered a drachm, clarified honey one ounce. Mix them.

Medical properties.—Useful in apthous affections of the fauces as a local detergent.

Mel rosæ. London.—Rose honey.

Take of the petals of the red rose dried four ounces, boiling water three pints, clarified honey five pounds. Macerate the petals in the water during six hours, and boil it down by means of a water-bath to a proper consistence. This is chiefly employed as an adjunct to gargles.

Oxymel simplex. London.—Simple oxymel.

Take of clarified honey two pounds, distilled vinegar one pound. Boil them in a glass vessel by a gentle heat to due consistence. A cooling beverage in fevers. Dose f. ʒj. or f. ʒij. dissolved in water or barley water.

Oxymel scillæ. London.—Oxymel of squill.

Take of clarified honey three pounds, vinegar of squill two pints. Boil in a glass vessel over a gentle fire to a due consistence.

Medical properties.—Expectorant. Dose f. ʒß to f. ʒij.

SYRUPI.—Syrups.

These with a very few exceptions might be banished from the pharmacopœias and disused in extemporaneous prescription.

Syrupus simplex. London.—Syrup.

Take of refined sugar two pounds and a half, water a pint. Dissolve the sugar in the water by means of a water-bath; then set it aside for twenty-four hours; separate the scum, and if there be any fæces, pour off the clear part from them.

Syrupus simplex. Edinburgh.—Simple syrup.

Take of purified sugar fifteen parts, water eight parts. Dissolve the sugar in the water by a gentle heat, and boil it a little so as to form syrup.

Syrupus aceti. Edinburgh.—Syrup of vinegar.

Take of vinegar five parts, refined sugar seven parts. Boil so as to form syrup. Useful in mixing with barley water in febrile and inflammatory disorders.

Syrupus althææ. London.—Syrup of marsh mallows.

Take of fresh marsh mallow root bruised half a pound, refined sugar two pounds, water four pints. Boil the water with the root down to one half, and express the liquor when it is cold; set it aside for twenty-four hours for the subsidence of the fæces, then decant off the clear liquor, and, having added the sugar to it, boil down to a due consistence.

Syrupus althææ officinalis. Edinburgh.—Syrup of marsh mallows.

Take of fresh root of marsh mallows sliced one part, water ten parts, refined sugar four parts. Boil the water with the root down to one half, and strain by strong expression. Put aside the strained liquor, and when the fæces have subsided add the sugar to it; then boil so as to form a syrup. A useless preparation, only slightly demulcent.

Syrupus aurantiorum. London.—Syrup of oranges.

Take of fresh orange peel two ounces, boiling water a pint, refined sugar three pounds. Macerate the peel in the water during twelve hours in a covered vessel; then pour the liquor off, and add the sugar to it.

Syrupus citri aurantii. Edinburgh.—Syrup of orange.

Take of the fresh peel of Seville oranges three ounces, boiling water one pound and a half, refined sugar three pounds. Macerate the peel with the water in a covered vessel during twelve hours; then add the sugar to the strained liquor, and subject it to a gentle heat so as to form a syrup.

Syrupus colchici autumnalis. Edinburgh.—Syrup of meadow saffron.

Take of fresh meadow saffron root cut into thin slices one ounce, distilled vinegar sixteen ounces, refined sugar twenty-six ounces. Macerate the root in the acid during two days, occasionally shaking the vessel; then expressing gently, strain the liquor, and add the sugar to it. Lastly, boil a little so as to form syrup. Dose f. ʒß. to f. ʒvj. gradually increased.

Syrupus croci. London.—Syrup of saffron.

Take of saffron one ounce, boiling water one pint, refined sugar two pounds and a half. Macerate the saffron in the water during twelve hours in a slightly covered vessel; then filter the liquor, and add to it the sugar.

Syrupus dianthi caryophylli. Edinburgh.—Syrup of the clove July flower.

Take of recent petals of the clove July flower freed from their claws one part, boiling water four parts, refined sugar seven parts. Macerate the petals in the water during twelve hours; then, to the liquor being strained add the sugar, and dissolve it with a gentle heat.

Syrupus lemonum. London.—Syrup of lemons.

Take of strained lemon juice a pint, refined sugar two pounds. Dissolve the sugar in the juice in the manner ordered for syrup.

Syrupus citri medicæ. Edinburgh.—Syrup of lemons.

Take of lemon juice strained, after the fæces have subsided, three parts; refined sugar five parts. Dissolve the sugar. An agreeable syrup for acidulating drinks.

Syrupus mori. London.—Syrup of mulberry.

Take of strained mulberry juice a pint, refined sugar two pounds. Let the sugar be dissolved in the juice in the manner directed for syrup.

Syrupus papaveris. London.—Syrup of poppy.

Take of the dried capsules of the poppy bruised and freed from seeds fourteen ounces, prepared sugar two pounds, boiling water two gallons and a half. Macerate the capsules in the water during twelve hours; then boil the whole in a water-bath down to one gallon, and strongly express. Boil the liquor again down to two pounds, and strain it while it is hot. Set it aside twelve hours for the subsidence of the fæces; then boil the clear liquor down to one pint, and add the sugar in the manner directed for making syrup.

Syrupus papaveris somniferi. Edinburgh.—Syrup of white poppy.

Take of the capsules of the white poppy dried and freed from the seeds one part, boiling water fifteen parts, refined sugar two parts. Macerate the sliced capsules in the water during twelve hours; then boil until a third part only of the liquor remains, and strain the decoction by strong expression. Boil the strained liquor down to one-half, and strain it again. Lastly, having added the sugar boil for a short time so as to form syrup. A useful anodyne. Dose from f. ℥ß. to f. ℥j.

Syrupus rhæados. London.—Syrup of the red poppy.

Take of the recent petals of the red poppy a pound, boiling water a pint and two fluid ounces, refined sugar a pound and a half. To the water heated in a water-bath gradually add the petals of the red poppy, stirring them occasionally; then, having removed the vessel, macerate during twelve hours, press out the liquor, and set it aside for the subsidence of the impurities. Lastly, add the sugar in the manner ordered for making syrup. A mere coloring syrup.

Syrupus rhamni. London.—Syrup of buckthorn.

Take of the fresh juice of buckthorn berries four pints, ginger root sliced, pimento berries bruised, of each an ounce, refined sugar three pounds and a half. Set apart the juice three days for the subsidence of the fæces; then strain.

To a pint of the cleared juice add the ginger root and pimento berries; then macerate with a gentle heat during four hours, and strain. Boil the remainder of the juice down to a pint and a half; mix the liquors, and add the sugar in the manner ordered for making syrup.

Syrupus rhamni cathartici. Edinourgh.—Syrup of buckthorn.

Take of the clarified juice of ripe buckthorn berries two parts, refined sugar one part. Boil so as to form syrup. The London formula the best. A brisk cathartic. Dose from f. ʒij. to f. ℥j.: not much used excepting in veterinary practice.

Syrupus rosæ. London.—Syrup of the rose.

Take of the petals of the hundred-leaved rose dried seven ounces, refined sugar six pounds, boiling water four pints. Macerate the rose petals in the water for twelve hours, and strain. Evaporate the strained liquor in a water-bath down to two pints and a half; then add the sugar so as to form syrup.

Syrupus rosæ centifoliæ. Edinburgh.—Syrup of damask roses.

Take of the fresh petals of the damask rose one part, boiling water four parts, refined sugar three parts. Macerate the petals in the water during twelve hours; then add the sugar to the strained liquor, and boil so as to form syrup. A gentle laxative. Dose from f. ʒij. to f. ℥iß.

Syrupus rosæ gallicæ. Edinburgh. Syrup of red roses.

Take of the petals of the red rose dried one part, boiling water nine parts, refined sugar ten parts. Macerate the petals in the water during twelve hours; then boil a little and strain. Add the sugar to the strained liquor, and again boil a little so as to form a syrup. A weak astringent.

Syrupus sarsaparillæ. London. Syrup of sarsaparilla.

Take of sarsaparilla root one pound, boiling water one gallon, refined sugar one pound. Macerate the root in the water during twenty-four hours, then boil down to four pints, and strain the liquor while hot; lastly, add the sugar and evaporate to a due consistence. A useless preparation.

Syrupus scillæ maritimæ. Edinburgh. Syrup of squill.

Take of vinegar of squill four parts, refined sugar in powder seven parts. Dissolve the sugar by a gentle heat so as to form syrup. Dose from f. ʒj. to f. ʒij.

Syrupus sennæ. London.--Syrup of senna.

Take of senna leaves two ounces, fennel seeds bruised one ounce, manna three ounces, refined sugar a pound, boiling water a pint. Macerate the senna leaves and the fennel seeds in the water in a gentle heat during twelve hours; strain the liquor; mix with it the manna and sugar, and boil down to a due consistence.

Syrupus cassiæ sennæ. Edinburgh.—Syrup of senna.

Take of senna leaves two ounces, boiling water a pound and a half, burnt syrup eight ounces. Macerate the leaves in the water in a covered vessel during four hours and strain; then add the syrup, and boil with a gentle heat until the whole acquire the consistence of the burnt syrup. Chiefly employed for children. Dose from ʒij. to f. ℥j

Syrupus tolutanus. London.—Syrup of tolu.

Take of balsam of tolu an ounce, boiling water a pint, refined sugar two pounds. Boil the balsam in the water during half an hour in a close vessel, frequently stirring it, and strain the liquor when cold; then add the sugar so as to form syrup.

Syrupus toluiferæ balsami. Edinburgh.—Syrup of tolu.

Take of simple syrup two pounds, tincture of balsam of tolu one ounce. To the syrup, immediately upon its being made and before it is quite cold, add gradually the tincture, frequently stirring.

Syrupus violæ odoratæ. Edinburgh.—Syrup of violet.

Take of the flowers of the odorous violet two parts, boiling water eight parts, refined sugar fifteen parts. Macerate the flowers in the water during twenty-four hours in a covered glass or glazed earthen ware vessel: then strain without expression, and add a sufficient quantity of sugar to make syrup. This syrup is principally employed as a test of acids and alkalies; but it is an agreeable laxative for young children.

Syrupus zingiberis. London.—Syrup of ginger.

Take of ginger roots sliced two ounces, boiling water a pint, refined sugar two pounds. Macerate the ginger root in the water during four hours and strain; then add the sugar so as to form syrup.

Syrupus amomi zingiberis. Edinburgh.—Syrup of ginger.

Take of ginger root powdered six drachms, boiling water one pound, refined sugar twenty-two ounces. Macerate the root in the water, the vessel being covered, for twenty-four hours; then add the sugar to the strained infusion and dissolve by a gentle heat. Carminative. Dose f. ʒij.

CONFECTIONES.—Confections.

Conserves and electuaries are included under this head in the last edition of the London Pharmacopœia.

Confectio amygdalarum. London.—Confection of almonds.

Take of sweet almonds an ounce, acacia gum in powder a drachm, refined sugar half an ounce. Macerate the almonds in water to separate the cuticle; then beat all the ingredients together, until they be completely incorporated. Used for forming the almond mixture.

Confectio aromatica. London.—Aromatic confection.

Take of cinnamon bark, nutmegs, of each two ounces; cloves one ounce; cardamom seeds half an ounce; saffron dried two ounces; prepared shells sixteen ounces; refined sugar in powder two pounds; water a pint. Rub the dry substances mixed together into a very fine powder; then gradually add the water, and mix until the whole be thoroughly incorporated.

Electuarium aromaticum. Edinburgh.—Aromatic electuary.

Take of the aromatic powder one part, syrup of orange two parts. Mix, and beat them well together so as to make an electuary. An excellent form of giving cordials and aromatics. Dose from ℈ß to ʒß or more.

Confectio aurantiorum. London.—Confection of oranges.

Take of the outer rind of the fresh orange separated by rasping a pound, refined sugar three pounds. Beat the rind in a stone mortar with a wooden pestle; then add the sugar and continue the beating until they be completely incorporated.

Conserva citri aurantii. Edinburgh.—Conserve of oranges.

Grate off the outer rind of Seville oranges, beat it into a pulp, and while beating it add gradually three times its weight of refined sugar. Stomachic. Dose ʒj. to ℥ß

Confectio cassiæ. London.—Confection of cassia.

Take of fresh cassia pulp half a pound, manna two ounces, tamarind pulp one ounce, syrup of roses half a pound. Bruise the manna; then dissolve it in the syrup by the heat of a water-bath, and, having mixed in the pulp, evaporate to a due consistence.

Electuarium cassiæ fistulæ. Edinburgh.—Electuary of cassia.

Take of cassia pulp four parts, tamarind pulp, manna, of each one part, syrup of damask roses four parts. Bruise the manna in a mortar, and dissolve it in the syrup by means of a gentle heat; then add the pulps, and by a continued heat reduce the mixture to a due consistence. Gently laxative. Dose ʒj. to ʒvj.

Confectio opii. London.—Confection of opium.

Take of hard opium in powder six drachms, long pepper an ounce, ginger root two ounces, carraway seeds three ounces, syrup a pint. Rub the opium with the syrup made hot; then add the remaining articles reduced to powder and mix them.

Electuarium opiatum. Edinburgh.—*Olim electuarium thebaicum.*—Opiate electuary, formerly thebaic electuary.

Take of aromatic powder six ounces, Virginian snake root in fine powder three ounces, opium diffused in a sufficient quantity of Spanish white wine half an ounce, syrup of ginger a pound. Mix so as to form an electuary.

Medical properties.—Excellent forms of giving opium in chronic affections of the bowels, &c. Dose from gr. vj. to ℈ij.

Confectio piperis nigri. London.—Confection of black pepper.

Take of black pepper, elecampane root, of each one pound; fennel seeds three pounds; honey, refined sugar, of each three pounds. Rub the dry ingredients together into a fine powder; then add the honey and beat the whole into a mass. A substitute for Ward's paste. Dose ʒj. to ʒij.

Electuarium catechu compositum. Edinburgh.—Compound electuary of catechu.

Take of extract of catechu four ounces, kino three ounces, cinnamon bark, nutmegs, of each one ounce, opium diffused in a sufficient quantity of Spanish white wine a drachm and a half, syrup of red roses boiled to the thickness of honey, two pounds and a quarter. Reduce the solid ingredients to powder; then mix them with the opium and honey so as to make an electuary. Dose ʒß to ʒij.

Confectio rosæ caninæ. London.—Confection of the dog-rose.

Take of the pulp of the dog-rose a pound, refined sugar in powder twenty ounces. Rub them together so as completely to incorporate them.

Confectio rosæ gallicæ. London.—Confection of the red rose.

Take of the unblown petals of the red rose freed from the claws a pound, refined sugar three pounds. Beat the petals in a stone mortar; then add the sugar, and beat again until the whole be completely incorporated.

Edinburgh.—Beat the unblown petals of the red rose to a pulp, and add, during the beating, three times their weight of refined sugar.

Confectio rutæ. London.—Confection of rue.

Take of rue leaves dried, carraway seeds, laurel berries, of each an ounce and a half; sagapenum half an ounce; black pepper two drachms; clarified honey sixteen ounces. Let the dry articles be rubbed together into a very fine powder; then add the honey, and mix the whole together. Used principally rubbed down with gruel in enemeta for childrens' convulsions; one or two scruples being employed as a dose.

Confectio scammoniæ. London.—Confection of scammony.

Take of scammony in powder an ounce and a half; bruised cloves, powdered ginger root, of each six drachms; oil of carraway half a drachm; syrup of roses a sufficient quantity. Rub the dry substances into a very fine powder; then gradually add the syrup, and rub them again; lastly, after adding the oil of carraway, mix the whole.

Confectio sennæ. London.—Confection of senna.

Take of senna leaves eight ounces; figs a pound; tamarind pulp, cassia pulp, the pulp of prunes, of each half a pound; coriander seeds four ounces; liquorice root three ounces; refined sugar two pounds and a half. Powder the senna leaves with the coriander seeds, and separate ten ounces of the mixed powder by sifting. Boil the residue with the figs and liquorice root in four pints of water until it be reduced one half; then press out and strain the liquor. Evaporate the strained liquor in a water-bath until of the whole only a pint and a half remain; then the sugar being added make a syrup; finally mix the pulps gradually with the syrup, and having added the sifted powder let the whole be mixed together.

Electuarium sennæ compositum. Edinburgh.—Compound electuary of senna.

Take of senna leaves eight ounces, coriander seeds four ounces, liquorice root bruised three ounces, figs, pulp of prunes, of each a pound, pulp of tamarinds half a pound, refined sugar two pounds and a half, water four pounds. Rub the senna with the coriander, and separate ten ounces of the mixed powder by sifting. Boil the residue with the figs and liquorice root in the water down to one half; then express and strain. Evaporate the strained liquor to about a pound and a half; add the sugar, and gradually the pulps; and lastly mix in the powder.

Medical properties.—Mild and efficacious purgatives, similar to the old lenitive electuary. Dose ʒij. to ℥ß.

PULVERES.—Powders.

Pulvis aloes compositus. London.—Compound powder of aloes.

Take of extract of spiked aloes an ounce and a half, guaiacum gum resin an ounce, compound powder of cinnamon half an ounce. Let the extract of aloes and the guaiacum be powdered separately, then mix them with the compound powder of cinnamon.

Medical properties.—Warm cathartics. Dose ℈ß to ℈j.

Pulvis asari compositus. Edinburgh.—Compound powder of asarabacca.

Take of the leaves of asarabacca three parts, the leaves of majoram, and flowers of lavender, of each one part. Let them be rubbed together into a powder.

Principally used in tooth ache, snuffed up the nostrils.

Pulvis cinnamomi compositus. London.—Compound powder of cinnamon.

Take of cinnamon bark two ounces, cardamom seeds one ounce and a half, ginger root one ounce, long pepper half an ounce. Rub them together into a very fine powder.

Pulvis aromaticus. Edinburgh.—Aromatic powder.

Take of cinnamon bark, cardamom seeds, ginger root, of each equal parts. Rub them to a very fine powder, which must be preserved in a well stopped phial.

Medical properties.—Aromatic and carminative. Dose ℈ß to ℈j.

Pulvis contrayervæ compositus. London.—Compound powder of contrayerva.

Take of contrayerva root in powder five ounces, prepared shells a pound and a half. Let them be mixed.

Medical properties.—Sudorific and stimulant, not so much used as formerly. Dose ℈ß to ʒß.

Pulvis cornu usti cum opio. London.—Powder of burnt hartshorn with opium.

Take of hard opium in powder a drachm, hartshorn burnt and prepared an ounce, cochineal powder a drachm. Let them be mixed.

Pulvis opiatus. Edinburgh.—Opiate powder.

Take of opium one part, prepared carbonate of lime nine parts. Let them be rubbed together into a fine powder. Dose of these powders gr. v. to ℈j.

Pulv cretæ compositus. London.—Compound powder of chalk.

Take of prepared chalk half a pound, cinnamon bark four ounces, tormentil root and acacia gum of each three ounces, long pepper half an ounce. Let them separately be rubbed into fine powder, and then the whole mixed.

Pulvis carbonatis calcis compositus. Edinburgh.—Compound powder of carbonate of lime.

Take of prepared carbonate of lime four ounces, cinnamon bark a drachm and a half, nutmeg half a drachm. Rub them together into a powder.

Medical properties.—Astringent and antacid; the London preparation the most efficacious. Dose gr. v. to ℈j.

Pulv. cretæ compositus cum opio. London.—Compound powder of chalk with opium.

Take of compound powder of chalk six ounces and a half; hard opium four scruples. Let them be mixed.

Medical properties.—Anodyne as well as astringent. Dose from gr. xv. to ℈ij.

Pulvis jalapæ compositus. Edinburgh.—Compound powder of jalap.

Take of powder of jalap root one part, supertartrate of potassa two parts. Let them be rubbed together into a fine powder.

Medical properties.—Deobstruent, and purgative. Dose ℈j. to ℈ij.

Pulvis ipecacuanhæ compositus. London.—Compound powder of ipecacuanha.

Take of ipecacuanha root powdered, hard opium in powder, of each a drachm; sulphate of potassa powdered one ounce. Mix them.

Pulvis ipecacuanhæ et opii. Edinburgh.—Powder of ipecacuanha and opium.

Take of ipecacuanha root powdered, opium, of each one part; sulphate of potassa eight parts. Rub them together into a fine powder

Medical properties.—Sudorific. A substitute for the old Dover's powder. Dose grs. v. to ℈j.

Pulvis kino compositus. London.—Compound powder of kino

Take of kino fifteen drachms, cinnamon bark half an ounce, hard opium a drachm. Rub them separately into a very fine powder, and mix them.

Medical properties.—Astringent. Dose ℈ß. to ℈j.

Pulvis salinus compositus. Edinburgh.—Compound saline powder.

Take of pure muriate of soda, sulphate of magnesia, of each four parts; sulphate of potassa three parts. Dry the salts with a gentle heat; then powder them separately, and afterwards rub them together. Let the powder be preserved in a well stopped vial.

Medical properties.—Purgative. Dose from ℥ß. to ℥j.

Pulvis scammoniæ compositus London.—Compound powder of scammony.

Take of scammony, hard extract of jalap, of each two ounces; ginger root half an ounce. Rub them separately into a very fine powder, and mix them.

Pulvis scammoniæ compositus. Edinburgh.—Compound powder of scammony.

Take of scammony, supertartrate of potassa, of each equal parts. Let them be rubbed together to a very fine powder.

Medical properties.—Cathartic, and vermifuge. Dose of the first from grs. x. to ℈j., of the second from ℈ß. to ʒß.

Pulvis sennæ compositus. London.—Compound powder of senna.

Take of senna leaves, supertartrate of potassa, of each two ounces; scammony half an ounce; ginger root two drachms. Reduce the scammony to a very fine powder by itself, and the other ingredients together; then mix the whole.

Pulvis aluminis compositus. Edinburgh.—Compound powder of alum.

Take of sulphate of alum four parts, kino one part. Let them be rubbed together to a fine powder.

Medical properties.—Astringent. Dose ℈ß. to be taken dry.

Pulvis tragacanthæ compositus. London.—Compound powder of tragacanth.

Take of tragacanth powder, acacia gum powdered, starch, of each one ounce and a half; refined sugar three ounces. Let the starch and the sugar be rubbed together to a powder; then add the tragacanth and the acacia gum; and mix the whole together.

Medical properties.—Demulcent. Dose ℈ij. to ʒiß.

Pilulæ.—Pills.

Pilulæ aloes compositæ. London.—Compound aloetic pills.

Take of extract of spiked aloes powdered an ounce, extract of gentian half an ounce, oil of carraway forty minims, syrup a sufficient quantity. Beat them together until they combine into a uniform mass.

Pilulæ aloeticæ. Edinburgh.—Aloetic pills.

Take of socotorine aloes in powder, soap, of each equal parts. Beat them with simple syrup so as to form a mass proper for making into pills.

Medical properties.—Purgative and stomachic. Dose ℈ß. to ℈j.

Pilulæ aloes et assafætidæ. Edinburgh.—Pills of aloes and assafœtida.

Take of socotorine aloes in powder, assafœtida soap, of each equal parts. Let them be beat into a mass with mucilage of gum arabic.

Medical properties.—Stomachic and aperient. Dose ℈ß.

Pilulæ aloes cum myrrha. London.—Pills of aloes with myrrh.

Take of extract of spiked aloes two ounces, saffron, myrrh, of each one ounce, syrup a sufficient quantity. Rub the aloes and myrrh separately to powder; and beat the whole into a mass.

Pilulæ aloes et myrrhæ. Edinburgh.—Pills of aloes and myrrh.

Take of socotorine aloes four parts, myrrh two parts, saffron one part. Beat them into a mass with simple syrup. Deobstruent, and cathartic. Dose ℈ß. to ℈j.

Pilulæ ammoniareti cupri. Edinburgh.—Pills of ammoniaret of copper.

Take of ammoniaret of copper rubbed to fine powder sixteen grains, crumb of bread four scruples, water of carbonate of ammonia a sufficient quantity. Let them be beaten into a mass and formed into thirty-two equal pills.

Medical properties.—Antiepileptic. Dose one pill twice a day, gradually increased.

Pilulæ cambogiæ compositæ. London. Edinburgh.—Compound pills of gamboge.

Take of gamboge in powder a drachm, extract of spiked aloes a drachm and a half, ginger in powder half a drachm, soap two drachms. Mix the powders together; then add the soap, and beat the whole into a mass.

Pilulæ colocynthidis compositæ. Edinburgh.—Compound colocynth pills.

Take of socotorine aloes, scammony, of each eight parts, colocynth pulp four parts, sulphate of potassa, oil of cloves, of each one part. Beat together the extract, gum resin, and sulphate, into powder, then with the colocynth pulp rubbed to fine powder. Mix them with the oil, and finally beat the whole into a mass with mucilage of gum.

Pilulæ ferri compositæ. London.—Pills of iron with myrrh.

Take of myrrh in powder two drachms, subcarbonate of soda, sulphate of iron, sugar, of each a drachm. Rub the myrrh with the subcarbonate of soda, then having added the sulphate of iron rub again, and lastly beat the whole into one mass.

Pilulæ galbani compositæ. London.—Compound pills of galbanum.

Take of galbanum an ounce, myrrh, sagapenum, of each an ounce and a half, assafœtida half an ounce, syrup a sufficient quantity. Beat them together into a mass.

Pilulæ assafætidæ compositæ. Edinburgh.—Compound assafœtida pills.

Take of assafœtida, galbanum, myrrh, of each eight parts, purified oil of amber one part. Beat them with simple syrup into a mass.

Medical properties.—Emmenagogue, and antispasmodic. Dose ℈ß. to ℈j.

Pilulæ hydrargyri. London.

Take of purified mercury two drachms, confection of red roses three drachms, liquorice root in powder a drachm. Rub the mercury with the confection until globules no longer are seen; then add the liquorice root, and beat the whole into one mass.

Edinburgh.—Take of purified mercury, conserve of the red rose, of each one ounce, starch two ounces. Rub the mercury with the conserve in a glass mortar until the globules entirely disappear, adding if necessary a little mucilage of gum arabic; then add the starch, and beat the whole into a mass with a little water, which is to be immediately divided into 480 equally sized pills. It is undetermined whether, in these preparations, the mercury is merely divided mechanically or whether it undergoes oxidation.

Medical properties.—Alterative, antisyphilitic and stimulant. Dose from grs. v. to ℈i. or more, accordingly as it may be desirable or not to produce the specific action of the mercury.

Pilulæ hydrargyri submuriatis compositæ. London. Edinburgh.—Pills of submuriate of mercury.

Take of submuriate of mercury, precipitated sulphuret of antimony, of each two drachms, guaiacum gum resin rubbed down, half an ounce, rectified spirit half a drachm. Rub the submuriate with the precipitated sulphuret of antimony, then with the guaiacum, and add a sufficient quantity of spirit (mucilage Edin.) to give them a proper consistence.

Medical properties.—A useful alterative and deobstruent. Dose grs. v. to ℈i. It is the Plummer's pill of the old pharmacopœias.

Pilulæ rhæi compositæ. Edinburgh.—Compound rhubarb pills.

Take of rhubarb root in powder one ounce, socotorine aloes six drachms, myrrh half an ounce, volatile oil of peppermint half a drachm. Beat them into a mass with syrup of orange-peel.

Medical properties.—Stomachic and carminative. Dose ℈ß. to ℈j.

Pilulæ saponis cum opio. London.—Pills of soap and opium.

Take of hard opium powdered half an ounce, hard soap two ounces. Beat them together till they become a mass.

Pilulæ opiatæ. Olim pilulæ thebaicæ. Edinburgh.—Opiate pills, formerly thebaic pills.

Take of opium one part, extract of liquorice seven parts, pimento berries two parts. Mix separately the opium and the extract, softened with diluted alcohol, and beat them into a pulp; then add the Jamaica pepper rubbed to powder, and let the whole be beaten into a mass. Dose of the London formula grs. v.; of the Edinburgh ℈ß.

Pilulæ scillæ compositæ. London.—Compound squill pills.

Take of fresh squill root dried and powdered one drachm, ginger root powdered and hard soap of each three drachms, ammoniacum powdered two drachms. Mix the powders together; then beat them with the soap, adding so much syrup as will give a proper consistence.

Pilulæ scilliticæ. Edinburgh.—Squill pills.

Take of squill root dried and rubbed to a fine powder one scruple, ammoniacum, cardamom seeds powdered, extract of liquorice, one drachm. Beat them into a mass with syrup.

Medical properties.—Expectorant, and diuretic. Dose ℈ß. to grs. xv.

Pilulæ subcarbonatis sodæ. Edinburgh.—Pills of subcarbonate of soda.

Take of exsiccated subcarbonate of soda four parts, hard soap three parts. Beat into a mass with simple syrup.

Medical properties.—Lithontriptic and diuretic. Dose grs. xv. to ℈j.

Pilulæ sulphatis ferri compositæ. Edinburgh.—Compound pills of sulphate of iron.

Take of sulphate of iron reduced to powder one ounce, extract of chamomile flowers one ounce and a half, oil of peppermint a drachm. Beat, with simple syrup, into a mass. Dose grs. v.

Trochisci.—Troches.

The London and the Dublin colleges have rejected these preparations.

Trochisci carbonatis calcis. Edinburgh.—Troches of carbonate of lime.

Take of prepared carbonate of lime four ounces, acacia gum one ounce, nutmegs one drachm, refined sugar six ounces. Rub them into powder, and form them into a mass fit for making troches by means of water.

Medical properties.—Antacid: but their effects are in some measure counteracted by the sugar.

Trochisci carbonatis magnesiæ. Edinburgh.—Troches of carbonate of magnesia.

Take of carbonate of magnesia six ounces, refined sugar three ounces, nutmegs a scruple. Beat them into a powder, and make them up into troches with tragacanth mucilage.

Medical properties.—Antacid and aperient.

Trochisci glycyrrhizæ glabræ. Edinburgh.—Troches of liquorice.

Take of extract of liquorice, gum arabic, of each one part, refined sugar two parts, boiling water a sufficient quantity. Dissolve and strain; then evaporate the solution by a gentle heat to a consistence proper for making troches.

Medical properties.—Demulcent.

Trochisci glycyrrhizæ cum opio. Edinburgh.—Liquorice troches with opium.

Take of opium two drachms, tincture of balsam of Tolu half an ounce, simple syrup eight ounces, extract of liquorice softened by hot water, gum arabic in powder, of each five ounces. First rub well the opium with the tincture; then gradually add the syrup and the extract; afterwards sprinkle in the powder of gum arabic; Lastly, the mass is to be dried and formed into troches of ten grains weight.

Medical properties.—The same as the last.

Trochisci gummosi. Edinburgh.—Gum troches.

Take of gum arabic four parts, starch one part, refined sugar twelve parts. Rub the whole into powder, and with rose make it up into a mass proper for forming troches.

Trochisci nitratis potassæ. Edinburgh.—Troches of nitrate of potassa.

Take of nitrate of potassa one part, refined sugar three parts. Beat them into powder, and form a mass fit for making troches, by means of tragacanth mucilage.

Medical properties.—Refrigerant. Dose two or three troches.

Preparata ex Animalibus.—Preparations from animals.

Adeps preparata. London.—Prepared fat.

Cut the fat into small fragments; then melt it with a gentle heat, and press it through linen.

Sevum preparatum. London.—Prepared suet.

Cut the suet into pieces; then melt it with a gentle heat, and press it through linen.

Cornu ustum. London.—Burnt hartshorn.

Burn pieces of hartshorn in an open fire until they become thoroughly white; then powder them, and prepare them in the manner ordered for the preparation of chalk.

Medical properties.— Exceedingly questionable.

Spongia usta. London.—Burnt sponge.

Cut sponge into small pieces, and bruise it in order to free it from any adhering extraneous substances; then burn it in a covered iron vessel till it become black and friable. Finally, let it be rubbed into a very fine powder.

Iodine and subcarbonate of soda are the active ingredients in burnt sponge.

Medical properties.— Deobstruent and tonic. Used especially in bronchocele. Dose from ʒj. to ʒij. or more, mixed with honey or other materials in the way of an electuary.

Testæ preparatæ. London.—Prepared shells.

Wash the shells with boiling water, having first freed them from extraneous matters; then prepare them in the manner directed for the preperation of chalk.

This preparation is superfluous.

Emplastra.—Plasters.

Emplastrum ammoniaci. London. Edinburgh.—Ammoniacum plaster.

Take of purified ammoniacum five ounces, diluted acetic acid half a pint. Dissolve the ammoniacum in the vinegar; then evaporate the solution in an iron vessel, assiduously stirring it until it become of a due consistence.

Medical properties. Resolvent. Useful in indolent tumors.

Emplastrum ammoniaci cum hydrargyro. London.—Ammoniacal plaster with mercury.

Take of purified ammoniacum a pound, purified mercury three ounces, sulphureted oil a fluid drachm. Rub the mercury with the sulphureted oil until the globules no longer appear; then gradually add the ammoniacum previously melted, and mix the whole together.

Medical properties.—Resolvent and discutient. Applicable to indolent swellings.

Emplastrum assafœtidæ. Edinburgh.—Assafœtida plaster.

Take of plaster of semivitreous oxide of lead, assafœtida, of each two parts; galbanum, yellow wax, of each one part.

Medical properties.—Antispasmodic and stimulant.

Emplastrum ceræ. London.—Wax plaster.

Take of yellow wax, prepared suet, of each three pounds; yellow resin a pound. Let them be melted together and strained.

Emplastrum simplex. Edinburgh.—Simple plaster.

Take of yellow wax three parts; mutton suet and white resin, of each two parts. Seldom employed.

Emplastrum cumini. London. Cumin plaster.

Take of cumin seeds, carraway seeds, laurel berries, of each three ounces; dried pitch three pounds; yellow wax three ounces. Let the pitch and the wax be melted together; then add the dry ingredients in powder so as to form a proper consistence.

Emplastrum galbani compositum. London.—Compound galbanum plaster.

Take of purified galbanum eight ounces, lead plaster three pounds, common turpentine ten drachms, resin of the spruced fir powdered three ounces. The galbanum and the turpentine having been mixed together, add first the resin and then the lead plaster previously melted by a slow fire, and mix the whole together.

Emplastrum gummosum. Edinburgh.—Gum plaster.

Take of plaster of semivitreous oxide of lead eight parts; ammoniacum, gum resin, galbanum, yellow wax, of each one part. Add the gum resin to the plaster and wax while melted, and mix.

Emplastrum hydrargyri. London.—Mercurial plaster.

Take of purified mercury three ounces, sulphureted oil a fluid drachm, lead plaster a pound. Rub the mercury with the sulphureted oil until globules no longer appear; then by degrees add the lead plaster, and mix the whole.

Edinburgh.—Take of olive oil, resin, of each one part; mercury three parts; plaster of semivitreous oxide of lead six parts. Rub the mercury with the oil and resin previously melted together and cooled until the globules disappear; then gradually add the plaster of semivitreous oxide of lead melted, and carefully mix the whole together.

Medical properties.—Discutient. Especially applicable to old syphilitic affections.

Emplastrum cantharidis. London.—Blistering plaster.

Take of blistering flies rubbed to a very fine powder a pound, wax plaster a pound and a half, prepared lard a pound. Melt the plaster and the lard together; and, having removed them from the fire just before they become solid, sprinkle in the blistering flies, and mix the whole together.

Emplastrum cantharidis vesicatoriæ. Edinburgh.—Blistering plaster.

Take of mutton suet, wax, white resin blistering plaster rubbed to a very fine powder, of each equal weights. Mix the powder with the other articles previously melted together and removed from the fire; then stir till the mixture stiffens in cooling.

Emplastrum cantharidis vesicatoriæ compositum. Edinburgh.—Compound plaster of Spanish flies.

Take of Venice turpentine eighteen parts; Burgundy pitch, blistering flies, of each twelve parts, yellow wax four parts; subacetate of copper two parts; white mustard seed, black pepper, of each one part. Melt the Burgundy pitch and the wax, and add the turpentine to them. While these remain warm after being melted, sprinkle in the other ingredients reduced to fine powder, and mix, constantly stirring, so as to form a plaster. More active and immediate in its operation than the common blistering plaster.

Emplastrum opii. London. Edinburgh.—Plaster of opium.

Take of hard opium powdered half an ounce, resin of the spruce fir powdered three ounces, lead plaster a pound. Melt the plaster and the resin together, then let the opium be added, and the whole mixed.

Medical properties.—Anodyne and antirheumatic.

Emplastrum oxidi ferri rubri. Edinburgh.—Plaster of red oxide of iron.

Take of plaster of semivitreous oxide of lead twenty-four parts, white resin six parts, yellow wax, olive oil, of each three parts, red oxide of iron eight parts. Rub the red oxide of iron with the oil, and adding the other ingredients melted, let the whole be well mixed.

Medical properties.—Supposed tonic.

Emplastrum picis compositum. London.—Compound pitch plaster.

Take of Burgundy pitch two pounds; resin of the spruce fir a pound; yellow resin, yellow wax, of each four ounces; expressed oil of nutmeg an ounce; olive oil, water, of each two fluid ounces. To the pitch, resin, and wax, melted together, first add the resin of the spruce fir, then the oil of nutmeg, the olive oil, and the water. Mix the whole and reduce it to a due consistence.

Medical properties.—Stimulant and rubefacient.

Emplastrum plumbi. London.—Lead plaster.

Take of semivitreous oxide of lead rubbed to a very fine powder five pounds, olive oil a gallon, water two pints. Boil them together over a slow fire, constantly stirring, until the oil and oxide unite into the consistence of a plaster. It will, however, be necessary to add a little boiling water, if that which was employed in the beginning shall have been consumed before the completion of the process.

Emplastrum oxidi plumbi semivitrei. Edinburgh.—Plaster of semivitreous oxide of lead.

Take of the semivitreous oxide of lead one part, olive oil two parts, water a sufficient quantity. Boil them, constantly stirring, until the oil and the oxide combine into a plaster.

Medical properties.—Principally employed for mechanical support and defence.

Emplastrum resinæ. London.—Resin plaster.

Take of yellow resin half a pound, lead plaster three pounds. Melt the lead plaster with a gentle heat, then add the resin powdered and mix.

Emplastrum resinosum. Edinburgh.—Resinous plaster.

Take of plaster of semivitreous oxide of lead five parts, resin one part. Melt them with a gentle heat; then continue stirring the liquor until it become stiff in cooling.

Medical properties.—Principally adhesive.

Emplastrum saponis. London.—Soap plaster.

Take of hard soap sliced half a pound, lead plaster three pounds. Mix the soap with the melted plaster; then boil it down to a due consistence.

Emplastrum saponaceum. Edinburgh.—Soap plaster.

Take of semivitreous oxide of lead four parts, gum plaster two parts, soap sliced one part. Mix the soap with the plasters melted together; then boil them a little so as to form plaster.

Medical properties.—Discutient, but less efficacious than the mercurial plaster.

CERATA.—Cerates.

Substances intermediate between plasters and ointments.

Ceratum simplex. London.—Cerate.

Take of olive oil four fluid ounces, yellow wax four ounces. Add the oil to the melted wax, and mix.

Medical properties.—Emollient: used for excoriations.

Ceratum calaminæ. London.—Calamine cerate.

Take of prepared calamine, yellow wax, of each half a pound, olive oil a pint. Mix the oil with the melted wax; then let the mixture be taken from the fire, and so soon as it begins to thicken add the calamine, constantly stirring, until it be cold.

Ceratum carbonatis zinci impuri. Edinburgh.—Cerate of impure carbonate of zinc.

Take of simple cerate five parts, prepared impure carbonate of zinc one part. Mix.

Medical properties.—Useful for excoriations, burns, &c. They have been called Turner's cerate.

Ceratum cetacei. London.—Spermaceti cerate.

Take of spermaceti half an ounce, white wax two ounces, olive oil four fluid ounces. Let the spermaceti and the wax be melted together; then add the oil and stir them until they are cold.

Ceratum simplex. Edinburgh.—Simple cerate.

Take of olive oil six parts, white wax three parts, spermaceti one part. Let the wax and the spermaceti be melted in the oil with a gentle heat; then constantly stir until the mixture stiffen in cooling.

Ceratum cantharidis. London.—Cerate of blistering flies.

Take of spermaceti cerate six drachms, blistering flies rubbed to a very fine powder a drachm. Add the blistering flies to the cerate softened by the fire, and mix them together.

Medical properties.—Employed to keep open blistered surfaces.

Ceratum plumbi acetatis. London.—Cerate of acetate of lead.

Take of acetate of lead in powder two drachms, white wax two ounces, olive oil half a pint. Melt the wax in seven fluid ounces of the oil; then add gradually the acetate, separately rubbed down with the remaining oil, and stir with a wooden spatula until the mass be thoroughly formed.

Medical properties.—Exceedingly useful for burns and excoriations.

Ceratum plumbi compositum. London.—Compound cerate of lead.

Take of solution of acetate of lead two fluid ounces and a half, yellow wax four ounces, olive oil nine fluid ounces, camphor half a drachm. Melt the wax and mix it with eight fluid ounces of the oil; then let them be removed from the fire, and as soon as they begin to thicken add gradually the solution of acetate of lead, and stir assiduously with a wooden spatula until they be cold. Lastly, mix the camphor dissolved in the remainder of the oil.

Medical properties.—The same as the last. It is called Goulard's cerate.

Ceratum resinæ. London.—Resin cerate.

Take of yellow resin, yellow wax, of each a pound, olive oil a pint. Melt together the resin and the wax by a slow fire; then add the oil and strain the cerate while it is hot through a linen cloth.

Unguentum resinosum. Edinburgh.—Resinous ointment.

Take of hogs' lard eight parts, resin five parts, yellow wax two parts. Melt the whole by a gentle heat, and stir the mixture until it become stiff in cooling.

Medical properties.—Stimulant and detergent.

Ceratum sabinæ. London.—Cerate of savine.

Take of the fresh leaves of savine bruised a pound, yellow wax half a pound, prepared lard two pounds. Melt together the lard and the wax and boil the savine leaves in the mixture; then strain through a linen cloth.

Medical properties.—Stimulant. It is used to keep open blisters when the cantharides are thought too stimulating.

Ceratum saponis. London.—Soap cerate.

Take of hard soap eight ounces, yellow wax ten ounces, semivitreous oxide of lead powdered a pound, olive oil a pint, vinegar a gallon. Boil the vinegar or the oxide of lead over a slow fire, gently stirring until they incorporate; then add the soap and boil again in the same manner until the moisture be entirely evaporated; lastly, let the wax previously melted be mixed with the oil.

Medical properties.—This is properly a cerate of acetate of lead. It is a cooling dressing to inflamed surfaces.

UNGUENTA.—Ointments.

Unguentum acidi nitrosi. Edinburgh.—Ointment of nitrous acid.

Take of hogs' lard one pound, nitrous acid six drachms. Mix gradually the acid with the melted lard, and assiduously as it cools beat the mixture.

Medical properties.—It has been employed in ulcers of a syphilitic and herpetic kind.

Unguentum cetacei. London.—Spermaceti ointment.

Take of spermaceti six drachms, white wax two drachms, olive oil three fluid ounces. Melt them together over a gentle fire, and stir them constantly until they be cold.

Medical properties.—Healing and emollient.

Unguentum elemi compositum. London.—Compound ointment of elemi.

Take of elemi a pound, common turpentine ten ounces, prepared suet two pounds, olive oil two fluid ounces. Melt the elemi with the suet, then let it be taken from the fire, and immediately mix in the turpentine and the oil. Lastly, strain the liquor through a linen cloth.

Medical properties.—Stimulant and digestive.

Unguentum hydrargyri fortius. London.—Strong mercurial ointment.

Take of purified mercury two pounds, prepared lard twenty-three ounces, prepared suet one ounce. First rub the mercury with the suet and a little of the lard until there be no appearance of globules, then add the remainder of the fat and mix.

Unguentum hydrargyri. Edinburgh.—Mercurial ointment.

Take of mercury, mutton suet, of each one part, hogs' lard three parts. Rub the mercury diligently in a mortar with a little of the hogs' lard, until there be no appearance of globules; then add the remainder of the lard. It may also be made with double or triple the quantity of mercury.

Unguentum hydrargyri mitius. London.—Milder mercurial ointment.

Take of the stronger mercurial ointment a pound, prepared lard two pounds. Mix them.

Medical properties.—It is used in friction for the same purposes with which mercury is given by the mouth when specific effects are required. Quantity for friction ʒj. night and morning. As in the case of the pilulæ hydrargyri so even here there are doubts whether the mercury is in a degree oxidised, or only mechanically divided.

Unguentum oxidi hydrargyri cinerei. Edinburgh.—Ointment of gray oxide of mercury.

Take of gray oxide of mercury one part, hog's lard three parts. Mix. Not much employed.

Unguentum hydrargyri nitratis. London.—Ointment of nitrate of mercury.

Take of purified mercury one ounce, nitric acid eleven fluid drachms, prepared lard six ounces, olive oil four fluid ounces. First dissolve the mercury in the acid; then while it is hot mix the solution with the lard and oil melted together.

Unguentum nitratis hydrargyri fortius, vulgò unguentum citrinum. Edinburgh.—Stronger ointment of nitrate of mercury.

Take of purified mercury one part, nitrous acid two parts, olive oil nine parts, hogs' lard three parts. Dissolve the mercury in the acid; then beat up the solution strongly in a glass mortar, with the lard and oil previously melted together and nearly cold, so as to make an ointment.

Unguentum nitratis hydrargyri mitius. Edinburgh.—Milder ointment of nitrate of mercury.

It is made in the same way as the stronger with a triple portion of oil and lard.

Medical properties.—These ointments are stimulant and detergent. They are useful in several chronic eruptions of the skin and in scrofulous affections of the eyelids.

Unguentum gallæ. London.—Ointment of galls.

Take of galls in fine powder one part, lard eight parts. Mix.

Medical properties.—Useful in piles.

Unguentum hydrargyri nitrico-oxydi. London.—Ointment of nitric oxide of mercury.

Take of nitric oxide of mercury one ounce, white wax two ounces, prepared lard six ounces. Melt the wax and the lard together; then add the nitric oxide of mercury in very fine powder, and mix.

Unguentum oxidi hydrargyri rubri. Edinburgh.—Ointment of red oxide of mercury.

Take of red oxide of mercury by nitric acid in fine powder one part, hogs' lard eight parts. Mix.

Medical properties.—Stimulant and detergent.

Unguentum hydrargyri præcipitati albi. London.—Ointment of white precipitate of mercury.

Take of white precipitate of mercury a drachm, prepared lard an ounce and a half. Add the precipitated mercury to the lard previously melted with a gentle heat, and mix.

Medical properties.—Useful in itch and other cutaneous affections, where sulphur is objected to.

Unguentum cantharidis. London.—Blistering ointment.

Take of blistering flies finely powdered two ounces, distilled water eight fluid ounces, resin cerate eight ounces. Boil the water with the blistering flies down to half its quantity, and strain. Mix the cerate with the strained liquor and evaporate to a due consistence.

Unguentum infusi cantharidis vesicatoriæ. Edinburgh.—Ointment of infusion of blistering flies.

Take of blistering flies, resin, yellow wax, of each one part; Venice turpentine, hogs' lard, of each two parts; boiling water four parts. Macerate the flies in the water during one night, and strain the liquor with strong expression; add the liquor to the fat, and boil until the water be evaporated; then add the wax and resin, and these being melted remove the liquor from the fire; add the Venice turpentine, and mix. These are injudicious preparations.

Unguentum juniperi sabinæ. Edinburgh.—Ointment of savine.

Take of fresh leaves of savine two parts, yellow wax one part, lard four parts. Melt the wax and lard together, then boil the leaves in the mixture, and express through a cloth. Used for keeping blistered surfaces open.

Unguentum carbonatis plumbi. Edinburgh.—Ointment of carbonate of lead.

Take of simple ointment five parts, carbonate of lead one part. Mix.

Medical properties.—A cooling desiccative ointment.

Unguentum oxidi zinci impuri. Edinburgh.—Ointment of impure oxide of zinc.

Take of simple liniment five parts, prepared impure oxide of zinc one part. Mix. Not at present much employed.

Unguentum picis liquidæ. London.—Tar ointment.

Take of tar, prepared suet, of each a pound. Melt them together, and strain the mixture through a linen cloth.

Edinburgh.—Take of tar five parts, yellow wax two parts. Melt the wax with a gentle heat; then add the tar, and stir until the mixture become stiff in cooling.

Medical properties.—Detergent and stimulant.

Unguentum picis nigræ. London.—Ointment of black pitch.

Take of black pitch, yellow resin, of each nine ounces; olive oil one pint. Let them be melted togetherand strained through black cloth.

Medical properties.—Digestive and stimulant.

Unguentum pulveris cantharidis vesicatoriæ. Edinburgh.—Ointment of the powder of blistering flies.

Take of resinous ointment seven parts, powdered blistering flies one part. Sprinkle the powder into the melted ointment, and stir the mixture until it stiffen in cooling.

Medical properties.—Used to keep blistered surfaces open.

Unguentum resinæ nigræ. London.—Black resin ointment.

Take of black resin, yellow wax, yellow resin, of each nine ounces; olive oil a pint. Melt them together, and strain through a linen cloth.

Unguentum sambuci. London.—Elder ointment.

Take of elder flowers, prepared lard, of each two ounces. Boil the elder flowers in the lard until they become crisp; then let the ointment be strained through a linen cloth.

Merely simple ointments, and therefore useless preparations.

Unguentum simplex. Edinburgh.—Simple ointment.

Take of olive oil five parts, white wax two parts. Melt the wax in the oil; then stir the mixture until it become stiff in cooling.

Unguentum subacetatis cupri. Edinburgh.—Ointment of subacetate of copper.

Take of resinous ointment fifteen parts, subacetate of copper one part. Sprinkle the subacetate into the melted ointment, and stir until the mixture become stiff in cooling.

Medical properties.—Detergent and escharotic.

Unguentum sulphuris. London.—Sulphur ointment.

Take of sublimed sulphur three ounces, prepared lard half a pound. Mix.

Edinburgh.—Take of hog's lard four parts, sublimed sulphur one part. Mix.

Medical properties.—Specific in itch.

Unguentum sulphuris compositum. London.—Compound ointment of sulphur.

Take of sublimed sulphur half a pound, white hellebore root in powder two ounces, nitrate of potassa a drachm, soft soap half a pound, prepared lard a pound and a half. Mix.

Medical properties.—The same but more stimulant than the last.

Unguentum veratri. London.—Ointment of white hellebore.

Take of white hellebore root in powder two ounces, prepared lard eight ounces, oil of lemon twenty minims. Mix.

Medical properties.—Less certain for the cure of itch than the sulphur ointment.

Unguentum zinci. London.—Zinc ointment.

Take of oxide of zinc one ounce, prepared lard six ounces. Mix.

Unguentum oxidi zinci. Edinburgh.—Ointment of oxide of zinc.

Take of simple liniment six parts, oxide of zinc one part. Mix.

Medical properties.—Astringent and healing.

Linimenta.—Liniments.

Linimentum æruginis. London. Liniment of verdigris.

Take of verdigris powdered an ounce, vinegar seven fluid ounces, clarified honey fourteen ounces. Let the verdigris be dissolved in the vinegar, and the solution strained through a linen cloth; then, having added the honey, boil the mixture to a due consistence.

Medical properties. Detergent and escharotic, not much used.

Linimentum ammoniæ fortius. London. Stronger liniment of ammonia.

Take of solution of ammonia a fluid ounce, olive oil two fluid ounces. Shake them together until a union is formed.

Oleum ammoniatum. Edinburgh. Ammoniated oil.

Take of olive oil eight parts, water of ammonia one part. Mix.

Medical properties. Rubefacient. Useful in chronic rheumatism.

Linimentum ammoniæ subcarbonatis. London. Liniment of subcarbonate of ammonia.

Take of solution of subcarbonate of ammonia a fluid ounce, olive oil three fluid ounces. Shake them together so as to form a union.

Linimentum aquæ calcis, sive oleum lini cum calce. Edinburgh. Liniment of lime water.

Take of linseed oil, lime-water, of each equal parts. Mix.

Medical properties.—Useful for burns and scalds.

Linimentum camphoræ. London.—Liniment of camphor.

Take of camphor half an ounce, olive oil two fluid ounces. Dissolve the camphor in the oil.

Oleum camphoratum. Edinburgh.—Camphorated oil.

Take of olive oil four parts, camphor one part. Mix so as to dissolve the camphor.

Medical properties.—Useful in glandular swellings and in chronic rheumatism. In cases of deafness arising from hardened wax it will be often useful to put some of this oil at night into the ear by means of cotton or lint.

Linimentum camphoræ compositum. London.—Compound liniment of camphor.

Take of camphor two ounces, solution of ammonia six fluid ounces, spirit of lavender a pint. Mix the solution with the spirit; then distil a pint with a gentle heat from a glass retort. Lastly, dissolve the camphor in this distilled liquor.

Medical properties.—Stimulant and rubefacient.

Linimentum hydrargyri. London.—Liniment of mercury.

Take of the stronger mercurial ointment, prepared lard, of each four ounces; camphor an ounce; rectified spirit fifteen minims; solution of ammonia four fluid ounces. First rub the camphor with the spirit, then with the lard and mercurial ointment. Lastly, drop gradually in the solution of ammonia and let the whole be mixed.

Medical properties.—Stimulant and discutient, especially of chronic affections of the syphilitic kind.

Linimentum saponis compositum. London.—Compound soap liniment.

Take of hard soap three ounces, camphor one ounce, spirit of rosemary a pint. Dissolve the camphor in the spirit; then add the soap, and macerate in the heat of a sand-bath, till a solution be effected.

Tinctura saponis camphorata, vulgò *linimentum saponaceum.* Edinburgh.—Camphorated tincture of soap, commonly called liniment of soap.

Take of hard soap sliced four ounces, camphor two ounces, volatile oil of rosemary half an ounce, alcohol two pounds. Let the soap be digested in the alcohol during three days; then add the camphor and the oil, frequently shaking the mixture.

Medical properties.—Stimulant and anodyne.

Tinctura saponis et opii, vulgò *linimentum anodynum.* Edinburgh.—Tincture of soap and opium, commonly called anodyne liniment.

Take of hard soap sliced four ounces, opium one ounce, camphor two ounces, oil of rosemary half an ounce, alcohol two pounds. Let the soap be digested in the alcohol for three days; then to the strained solution add the camphor and the oil, frequently shaking the mixture.

Medical properties.—Stimulant and anodyne.

Linimentum terebinthinæ. London.—Turpentine liniment.

Take of cerate of resin a pound, oil of turpentine half a pint. Melt the cerate; then add the oil of turpentine, and mix.

Medical properties.—An excellent application to recent burns and scalds.

CATAPLASMATA.—Cataplasms.

Cataplasma fermenti. London.—Yeast cataplasm.

Take of flour a pound, yeast of beer half a pint. Mix, and expose the mixture to a gentle heat till it begin to swell.

Medical properties.—A corrector of foul ulcers, by virtue of the carbonic acid gas that is evolved.

Cataplasma sinapis. London.—Cataplasm of mustard.

Take of mustard seed, linseed, of each in powder half a pound; hot vinegar a sufficient quantity. Mix them to the consistence of a cataplasm

Medical properties.—Stimulant, rubefacient and often vesicatory.

PART III.

The principal FORMULÆ of MAGENDIE and others, and some which have been recently introduced into the PHARMACOPŒIA of the DUBLIN COLLEGE, and others employed in the UNITED STATES OF AMERICA.

In the application of chemistry to pharmaceutic and medical purposes much has recently been done towards ascertaining the precise principle upon which medicinal efficacy manifests itself; and many new remedies have been proposed and brought into practice, more especially among the French chemists by separating one portion from another, of a particular substance,—the separated portion being in several instances conceived to be that upon which the whole virtue of the material had depended. Concentration, elegance, and increase of effect, have thus been occasionally introduced into medicine, and much consequent good has resulted; in some instances, indeed, we may consider the proposed improvements to be questionable; for fact it is, as well pointed out by Dr. Paris in his Pharmacologia, that even the inert woody fibre of many vegetables when in combination with other of their principles becomes active, so that we may be misled in supposing that by an extraction and separation of a medicinal principle we extract and separate the whole of medicinal property.

Another objection may be taken against the new medicinals as it refers to their nomenclature: for in some instances the concentrated principles are named from their medicinal effects, as in the case of narcotine, while in others botanic, or chemical, or natural history principles regulate the appellation,—but the science of extraction, in the way now referred to, may be regarded as in its infancy, and time with more mature consideration will doubtless effect still more improvement of it.

The principal of the medicinal substances thus introduced are the following:

Strychnine and *brucine*, two peculiar vegetable alkalies, discovered by Messrs. Pelletier and Caventou, which exist in a state of combination with an acid called the igazuric, in the nux vomica, St. Ignatius's bean; the upas tieute of Java, and the snake wood, which separately and together are described as possessing the remarkable property of exciting strongly the spinal marrow without affecting, excepting indirectly, the functions of the brain, and as therefore being highly efficacious in some species of paralysis.

Morphine, a principle afforded by opium, and which, as well as by other means, may be obtained by treating opium with caustic ammonia, which is said to be the narcotic principle of the drug, and the salts of which are alleged to possess all the good properties of opium without its inconveniences.

Narcotine, one of the immediate principles likewise of opium, possessed of properties like those of morphine, but less powerful.

Emetine. M. M. Pelletier, and Magendie presented a memoir to the Academie des Sciences in 1817, in which it was announced as the result of a course of experiments, that the power of the various species of ipecacuanha depended on a peculiar principle denominated emetine, and that this substance being much more active than the ipecacuanha itself, without possessing either its disagreeable taste or nauseous smell, might on all occasions be substituted for it with advantage.' Pure emetine appears to be a new vegetable alkali.

Quinine and cinchonine.—The gray bark was found to yield cinchonine, a peculiar alkaline principle, while 'the yellow bark furnished an alkali, which, though in many respects resembling the other, differed in certain properties too remarkable to admit of their being confounded; this latter, therefore, its discoverers denominated quinine.'

Veratrine.—' We owe our knowledge of this substance also to M. M. Pelletier and Caventou. These indefatigable chemists had remarked that in the veratrican tribe, almost all the individuals besides the botanical characters possessed a distinctive and very acrid taste, while they produced a similar action on the animal economy. They accordingly conceived that it would be interesting to ascertain whether such properties did not reside in some particular substance common to all these plants. These conjectures were confirmed by an analysis of the seeds of the veratrum sabadilla, by which they separated the acrid principle, recognising in it all the alkaline properties. They afterwards detected it in the bulb of the colchicum autumnale, in that of the veratrum commune, or white hellebore; and named it veratrine from the family denomination belonging to the plant.'

Solanine.—The discoverer of this principle in two plants of the family of the solaneæ, the solanum nigrum and the solanum dulcamara, was M. Desfossé's, at Besançon. This principle possesses both narcotic and emetic powers, but the latter more decidedly and conspicuously than the former.

Delphine.—This alkali was detected in 1819 in the seeds of the delphinium staphisagria by M. M. Feneulle and Lassaigne, who thus named it from a belief that the acrid properties of the whole family depended upon this principle—an opinion, however, which has not been confirmed by the analysis of other plants belonging to it. The medicinal properties of delphine have not been much tried.

Gentianine.—' A very singular circumstance is connected with the discovery of this principle. M. M. Henry and Caventou were both employed at the same time, and without any knowledge of each other's proceedings, upon the analysis of gentian; and arrived at results so perfectly identical that, upon comparing notes, they found the appearance of co-operation so striking that they resolved to promulgate their labors together.' The principle obtained from the gentian and its action is that of a highly concentrated bitter, especially, it is said, applicable to scrofulous affections.

Iodine.—For an account of the discovery of this substance see the article CHEMISTRY. Its physical and medicinal properties are conspicuously directed to the glandular organisation and lymphatic system, and it has been employed in scrofula with reputed success.

Lupuline.—Dr. Ives of New York has the credit of discovering this principle as resident in the humulus lupulus. It is said to be aromatic, tonic, and narcotic. Some, however, have doubted its pretensions.

Piperine.—' This substance was discovered in the black pepper by M. Ærstaedt,' by whom it was supposed to be a vegetable alkali, but other experiments have tended to disprove this. It has lately been employed in Italy as a febrifuge.

Besides these principles, and time may probably add to their number rapidly, several new substances and combinations of substances have been introduced into the more recent pharmacopœias; and Dr. Thomson has availed himself of these additions in a very useful work he has published under the name of a Conspectus of the Pharmacopœias: what follows will be principally compiled from that publication; the articles to which the letter D is attached are from the last edition of the Dublin Pharmacopœia; those to which U. S. are added are from the order of the United States; and the others are French preparations.

Acetum opii. U. S.—Vinegar of opium.

Opium half a pound, vinegar three pints, bruised nutmeg one ounce and a half, saffron half an ounce, sugar four ounces, yeast a fluid ounce. Boil the first mentioned articles to a proper consistence; then add the sugar and yeast. Digest for seven weeks, and then decant, filter, and bottle up, adding a little sugar to each bottle.

Medical properties.—Anodyne. Dose from ♏v. to ♏xx.

Cinchonina (cinchonine).—Cinchonia. Dr. T. prefers the termination of these words in *a*.

Take any quantity of powder of cinchonia lancifolia; boil it in alcohol until it lose all bitterness, and distil the tincture to dryness. Dissolve the residue in boiling water acidulated with muriatic acid; then add an excess of magnesia, and boil for some minutes. Filtrate when cold, wash the magnesian residue with cold water, and dry it in a stove; then digest repeatedly in boiling alcohol, and mix the alcoholic liquors, which in cooling will yield crystals of cinchonia.

Medical properties.—In all cases in which bark is useful. Dose from gr. ij. to ℈ß.

Cyanuretum hydrargyri. D.—Cyanuret of mercury.

Take of the cyanuret of iron six parts, nitric oxide of mercury five parts, distilled water forty parts. Let the cyanuret of iron and oxide of mercury be mixed together, then add the hot water. Let the mixture be boiled for half an hour stirring it all the time, and then filter through blotting paper. Let the residue be well washed with distilled water. Finally evaporate the filtered solutions, and crystallise in cooling.

Medical properties.—The same as those of hydrocyanic acid, but more fitted for external application.

Decoctum calumbæ compositum. U. S.—Compound decoction of Calumba.

Take of bruised Calumba root, quassia shavings, of each two drachms, orange peel one drachm, powdered rhubarb a scruple, carbonate of potassa half a drachm, water twenty fluid ounces. Boil down to a pint, and add half a fluid ounce of tincture of lavender.

Medical properties. A tonic in convalescence from fever. Dose f. ℥.

Decoctum pyrolæ. D.—Decoction of winter green.

Take of pyrola umbellata one ounce, water by measure two pounds. Macerate for six hours, then bruise and return the pyrola to the liquor, and reduce the mixture by evaporation, when strained and expressed, to a pound by measure.

Medical properties.—Highly diuretic. Dose from f. ℥j. to f. ℥ij.

Decoctum scillæ. U. S.—Decoction of squill.

Take of squill three drachms, juniper berry four ounces, seneka root three ounces, water four pints. Boil to one-half, then strain, and add spirit of nitric ether four fluid ounces.

Medical properties.—Diuretic. Dose from f. ℥j. to f. ℥ij.

Emetina.—Emetine.

Take of powdered root of ipecacuanha any quantity: digest it several times in ether at 60° Fahrenheit, and then in alcohol. Evaporate the alcoholic tincture in a water-bath, and disolve the residue in cold water; then add magnesia and macerate; and, after drying the magnesian precipitate, digest it in pure alcohol, and evaporate the solution to dryness.

Medical properties. Emetic, narcotic, purgative. Dose from one third of a grain to grs. iij. in any bland fluid.

Incompatibles. Preparations of nutgalls, and all vegetable astringent infusions or decoctions.

Extractum nucis vomicæ. D.—Extract of nux vomica.

Take of rasped nux vomica eight ounces, proof spirit of wine by measure two pounds. Digest in a covered vessel for three days, strain the liquor, and express what remains in a press; to this residue add a pound and a half of proof spirit, digest for three days, and express the residue. Consume the mixed liquors by distillation, and reduce to a proper consistence.

Medical properties.—Antiparalytic. Dose gr. ¼ to gr. iß.

Ferri prussias. U. S.—Prussiate of iron. Prussian blue, composed of Prussic acid 35·1, red oxide of iron 53, water 11·9 in 100 parts.

Medical properties—Tonic and antispasmodic. In intermittents, scrofula, chorea, and epilepsy. Dose grs. iij. to grs. viij. in syrup thrice a day.

Hydriodas potassæ. D.—Hydriodate of potassa.

Take of iodine one part, sulphuret of iron in coarse powder five parts, sulphuric acid seven parts, distilled water forty-eight parts, water of carbonate of potassa as much as necessary, rectified spirits six parts. Mix the iodine by aid of friction with sixteen parts of the water, and pour the mixture into a glass vessel. Pour the acid diluted with thirty-two parts of the water upon the sulphuret, put into a matrass, and by a tube fitted to the neck of the matrass, and reaching to the bottom of the vessel containing the iodine and water, let the gas pass through the mixture until the iodine altogether disappears. Evaporate the strained liquor immediately with a greater heat, and strain it again. Then add enough of the solution of carbonate of potassa to saturate the acid, which is known by the effervescence ceasing. Then expose the mixture to a gentle heat until the residuary salt become dry and of a white color: pour the spirit upon this, and dissolve with heat. Finally evaporate the liqour poured off from the residuary salt, and having evaporated it to dryness let it be preserved in a stopped bottle.

Medical properties.—The same as iodine. Dose from gr. i. to grs. iij. of the dried salt; from ♏vj. to ♏xx. of the saturated solution. See *Iodine.*

Infusum cinchonæ cum succo limonum. U.S.—Infusion of cinchona with lemon juice.

Take of cinchona in powder one ounce, lemon juice two fluid ounces, compound tincture of camphor three fluid drachms, cold water a pint. Macerate for twelve hours in a covered vessel, and strain.

Medical properties.—Tonic when the stomach is too irritable to bear bark in the common way. Dose from f. ℥j. to f. ℥iij.

Infusum eupatorii.—Infusion of thoroughwort.

Take of eupatorium one ounce, hot water a pint. Infuse for two hours in a covered vessel, and strain.

Medical properties.— Emetic, diaphoretic; tonic when given cold.

Iodinium.—Iodine. D. See CHEMISTRY.

Medical properties.— Stimulant, absorbent, and emmenagogue. Useful in bronchocele and other glandular swellings not of a schirrhous nature; to bring on menstruation in young females in whom it has not occurred; to assist the cicatrization of venereal ulcers. Dose from one-sixth of a grain to grs. iv. in pills, with crumb of bread.

Linimentum tabaci. U.S.—Liniment of tobacco.

Take of cut tobacco one ounce, lard one pound. Simmer the tobacco in the lard over a gentle fire until it become crisp, and strain.

Medical properties.—Useful in tinea, scabies, and in hemorrhoids.

Liquor labarraquii chloro-sodaicus.—Chloro-sodaic solution of labarraque.

Dissolve grs. 2187·5 of pure crystallised carbonate of soda in f. ℥xx. of distilled water, and saturate the solution with chlorine gas.

Medical properties.—Antiseptic, astringent, tonic, used for disinfecting foul air, destroying animal putrefaction; an excellent lotion for chilblains, fetid ulcers, and gangrenous sores, and the best lotion in ptyalism yet discovered. Internally in dysentery. Dose from ♏xx. to f. ℥j. in a cupful of water; for a lotion or a gargle f. ʒxij. in f. ℥vj. of distilled water.

Liquor morphinæ acetatis.—Solution of acetate of morphia.

Take of acetate of morphia sixteen grains, distilled water six fluid drachms, dilute acetic acid f. ʒij; mix.

Medical properties.—See *Morphinæ acetas.* Dose from ♏vj. to ♏xxxvj. in any bland vehicle.

Mistura strychninæ.—Mixture of strychnia.

Take of strychnia gr. i., white sugar two drachms, distilled water two fluid ounces; mix.

Medical properties.—See *Strychnine.* Dose a dessert spoonful f. ʒij. every morning and evening.

Morphina (morphium). Morphia. Morphine.

Take a concentrated solution of opium, and boil it with magnesia in the proportion of ten grains for each pound of opium used. Filtrate and wash the deposit on the filter with cold rain or distilled water, and when it is dried digest it in a heat under 212° with weak alcohol. Filtrate and wash this deposit with a little cold alcohol; then boil it in a large quantity of rectified alcohol, and filtrate while the liquor is hot. The crystals are deposited as the liquor cools, and may be purified by repeated solutions and crystallisations. Robiquet's method.

Medical properties.—Sedative. Chiefly employed to prepare the salts of morphium. Dissolved in oil and rubbed on the skin it produces narcotic effects.

Morphiæ acetas.—Acetate of morphia.

Take of morphia four parts, distilled water eight parts. Mix them in a porcelain dish, and then add acetic acid, specific gravity 1·075, until litmus paper is slightly reddened. Evaporate slowly to dryness and reduce to powder (Codex Medicamentarius). It must be kept in a ground stoppered phial.

Medical properties.—Narcotic and sedative. Dose from gr. ½ to gr. iij.

Morphiæ sulphas.—Sulphate of morphia.

Take of morphia six parts, distilled water twelve parts, sulphuric acid diluted with twice its bulk of water a sufficient quantity to saturate the morphia. Evaporate slowly and crystallise (Codex Medicamentarius). To be kept in a stoppered phial.

Medical properties. See *Morphia.* Dose from gr. ꝶ. to grs. iij.

Oleum chenopodii. U. S.—Oil of wormseed. Distil from the seed.

Medical properties.—Anthelmintic. Dose ♏v. to ♏x.

Oleum succini oxidatum. U. S.—Oxidated oil of amber.

Take oil of amber a fluid drachm, nitric acid three fluid drachms and a half. Put the oil of amber in a glass vessel, and gradually drop the acid into it, at the same time stirring the mixture with a glass rod. Let it stand for thirty-six hours, then separate the supernatant resinous matter from the acid fluid beneath, and wash it repeatedly first with cold and lastly with hot water, till the acid taste be removed.

Medical properties.—A substitute for musk.

Opii extractum narcotinâ privatum.—Extract of opium freed from narcotine.

Macerate coarsely powdered opium in cold water, filtrate and evaporate to the consistence of syrup; then digest in rectified ether, and repeat this as long as any crystals of narcotine appear in the residue of the distilled ether. Lastly, evaporate the solution which has been thus treated to an extract.

Medical properties.—Anodyne; without being stimulating. Dose gr. i. to gr. vj.

Quininæ sulphas. D.—Sulphate of quinine.

Take of the yellow bark (heart leaved) in coarse powder four pounds, distilled water by measure eight pounds, diluted sulphuric acid two ounces. Mix in a proper vessel and in a high temperature, agitating frequently; digest for four hours, then strain; the residue of the bark is then to be again mixed with an equal quantity of water and strained; this should be done three times. To the mixed solutions add a quantity of fresh burnt lime sufficient to saturate the acid. Separate the precipitate by means of blotting paper, and add to it three pints of rectified spirit, then digest with frequent agitation for six hours and strain; again digest the residuary powder with an equal quantity of rectified spirit and strain. Let this be done three times. Mix the spirituous solutions, and evaporate to dryness in a water-bath. To the residue add gradually as much diluted sulphuric acid as will make it just sensibly acid; then evaporate and crystallise.

Medical properties.—Powerfully tonic; especially useful in intermittent fever. Dose gr. i. to ℈ß.

Sulphas quininæ. See *Quininæ sulphas,* above.

Strychnina, strychnium.—Strychnia.

To a solution of extract of nux vomica in water add a solution of subacetate of lead as long as any precipitate is formed. Filtrate and separate any excess of the subacetate of lead from the solution by sulphureted hydrogen; then filtrate again and boil the solution with magnesia; wash the precipitate with cold distilled water, redissolve it in alcohol, and evaporate. The residue of the evaporation is strychnia, which may be purified by dissolving it in muriatic acid, and precipitating by means of magnesia.

Medical properties.—Antiparalytic in cases of paraplegia. Dose gr. $\frac{1}{12}$ to gr. $\frac{1}{8}$, made into pills with crumb of bread.

Syrupus cinchoninæ.—Syrup of cinchona.

Take of sulphate of cinchonia gr. xxxix. simple syrup sixteen fluid ounces. Dose f. ʒj. to f. ℥j.

Syrupus emetinæ.—Syrup of emeta.

Take of pure emeta gr. iv., simple syrup a pound; mix.

Medical properties.—In catarrh, hooping cough, and all cases in which ipecacuanha is useful.

Syrupus morphiæ acetatis.—Syrup of acetate of morphia.

Take of clarified syrup one pound, acetate of morphia four grains. Dose f. ʒj. to f. ʒij.

Syrupus morphiæ sulphatis.—Syrup of sulphate of morphia.

Take of clarified syrup one pound, sulphate of morphia four grains. Make into a syrup. Dose f. ʒj. to f. ʒiv.

Syrupus quininæ.—Syrup of quinine.

Take of sulphate of quinine forty-four grains. simple syrup two pounds, mix. Dose f. ʒij. to f. ʒiv.

Tinctura capsici et cantharidum. U. S.—Tincture of Cayenne pepper and blistering flies.

Take of cantharides bruised ten drachms, capsicum one drachm; diluted alcohol a pint. Digest for ten days and filter.

Medical properties.—Stimulant and rubefacient.

Tinctura cinchoninæ.—Tincture of cinchonia.

Take of sulphate of cinchonia eight grains; alcohol a fluid ounce. Dose f. ʒj. to f. ʒiv.

Tinctura iodinii. D.—Tincture of iodine.

Take of iodine two scruples; rectified spirit a fluid ounce. Mix and dissolve the iodine by heat. Dose ♏x. to ♏xx.

Tinctura lobeliæ. U. S.—Tincture of Indian tobacco.

Take of Indian tobacco two fluid ounces, diluted alcohol a pint. Digest for ten days and filter.

Medical properties.—Emetic and expectorant. Dose f. ʒj. to f. ʒiij.

Tinctura nucis vomicæ. D.—Tincture of nux vomica.

Take of the fruit of the strychnus nux vomica rasped two fluid ounces, rectified spirit eight fluid ounces. Macerate for seven days, then strain.

Tinctura quininæ.—Tincture of quinia. Take of sulphate of quinia six grains, alcohol (specific gravity ·847) a fluid ounce. Dose f. ʒj. to f. ʒiij.

Tinctura sanguinariæ. U. S.—Tincture of blood root.

Take of bruised blood root two fluid ounces, alcohol a pint. Digest for ten days, and filter.

Medical properties.—Expectorant and tonic, and in large doses emetic. Dose ♏x. to f. ʒiss.

Tinctura strychninæ.—Tincture of strychnia.

Take of strychnia three grains, alcohol (specific gravity ·837) a fluid ounce. Dose ♏vi. to ♏xxiv.

Unguentum iodinii. D.—Ointment of iodine.

Take of iodine one scruple, prepared lard one ounce. Rub them together into an ointment.

Vinum cinchoninæ.—Wine of cinchonia.

Take of cinchonia fourteen grains, Madeira wine thirty-one fluid ounces. Dose f. ʒij. to f. ℥ij.

Vinum quininæ.—Wine of quinia.

Take of sulphate of quinia nine grains, Madeira wine two pounds. Dose from f. ʒiv. to f. ℥iv.

APPENDIX I.

An account of the constituent parts of some of the most popular among PATENT and other MEDICINES, extracted from Dr. PARIS'S PHARMACOLOGIA.

Anderson's pills are formed principally of aloes, with a portion of jalap and oil of aniseed.

Anodyne necklaces.—The roots of henbane are commonly strung in the form of beads, and sold under this name, to be tied round the necks of children to facilitate the growth of their teeth, and allay the irritation of teething.

Antivenereal drops, so famous at Amsterdam, were analysed by Scheele, who found that they were composed of muriate of iron, with a small portion of corrosive sublimate.

Aromatic vinegar (Henry's) is merely a solution of camphor and some essential oil. A preparation of this kind may be extemporaneously made by putting one drachm of acetate of potassa into a phial, with a few drops of some fragrant oil, and ♏xx. of concentrated sulphuric acid.

Balsam of honey, or *pectoral balsam*, is the tincture of benzoin, or that of Tolu.

Balsam of liquorice. (Pectoral). The proprietor of this nostrum gravely affirms, that f. ℥iss. contains the virtues of a whole pound of liquorice root; but, upon investigation, it will be found to consist principally of paregoric elixir, very strongly impregnated with the oil of aniseed.

Barclay's antibilious pills. Take of the extract of colocynth two drachms, resin of jalap one drachm, almond soap a drachm and a half, guaiacum three drachms, tartarised antimony eight grains, essential oils of juniper, carraway, and rosemary, of each four drops, of syrup of buckthorn, as much as will be sufficient to form a mass to be divided into sixty-four pills.

Bateman's pectoral drops consist principally of the tincture of castor, with portions of camphor and opium, flavored by aniseed and colored by cochineal.

Battley's sedative liquor (liquor opii sedativus). Under this name Mr. Battley, of Fore-street, London, has introduced a narcotic preparation, which it is generally supposed owes its efficacy to the acetate of morphia; on being kept, however, I found that it underwent some important change, during which so much air was disengaged as to blow out the cork from the bottle with violence. This is a great objection to its admission into practice. [We think it, however, right to state that this preparation has been used by us and very many of our friends with decided advantage over the common tincture of opium.—Ed.]

Black drop, or the *Lancaster or Quaker's black drop*. This preparation, which has long been known and esteemed as being more powerful in its operation, and less distressing in its effects, than any tincture of opium, has until lately been involved in much obscurity; the papers, however, of the late Edward Walton, of Sunderland, one of the near relations of the original proprietor, having fallen into the hands of Dr. Armstrong, that gentleman has obliged the profession by publishing the manner in which it is prepared, and is as follows:—'Take half a pound of opium sliced, three pints of good verjuice (juice of the wild crab), and one and a half ounce of nutmegs, and half an ounce of saffron. Boil them to a proper thickness; then add a quarter of a pound of sugar, and two spoonsful of yeast. Set the whole in a warm place near the fire for six or eight weeks; then place it in the open air until it become a syrup. Lastly, decant, filter, and bottle it up, adding a little sugar to each bottle. One drop of this preparation is considered about equal to three of the tincture of opium.—Ph. L. It would appear that an acetate of morphia is formed, which is more active and less distressing in its effects than any other narcotic combination.

The French Codex contains directions for preparing a compound very similar to the black drop, viz. *Vinum opiatum fermentatione paratum*, or *Gutta, seu laudanum abbatis Rousseau*. Take of white honey twelve ounces, warm water three pounds. Dissolve the honey in the water, pour it into a matrass and set it aside in a warm place; as soon as fermentation has commenced, add four ounces of good opium, having previously dissolved, or rather diffused it in twelve ounces of water. Allow them to ferment together for a month; then evaporate until ten ounces only remain. Filter, and add four ounces and a half of alcohol.

Brodum's nervous cordial consists of the tinctures of gentium, calumba, cardamom, and bark, with the compound spirit of lavender and wine of iron.

Ching's worm lozenges.—These consist of yellow and brown lozenges; the former are taken in the evening, the latter the succeeding morning.

The yellow lozenges. Saffron half an ounce, water a pint, boil and strain; add of white panacea of mercury (calomel washed in spirit of wine) a pound, white sugar twenty-eight pounds, mucilage of tragacanth as much as may be sufficient to make a mass, which roll out of an exact thickness, so that each lozenge may contain one grain of panacea. Dose from one to six.

The brown lozenges. Panacea seven ounces, resin of jalap three pounds and a half, white sugar nine pounds, mucilage of tragacanth enough for each lozenge to contain half a grain of panacea.

Cough drops.—Under this word, Dr. Paris says, Opium is the quack's sheet anchor. The various nostrums advertised as cough drops for the cure of colds, asthmas, catarrhs, &c., are preparations of opium very similar to paregoric elixir. Pectoral balsam of liquorice, and essence of coltsfoot, are combinations of this kind. Grindle's cough drops are a preparation of this kind, made with rectified spirit instead of proof spirit, and consequently more highly charged with stimulant materials. 'The mischief,' observes Dr. Fothergill, 'that has proceeded from the healing anodynes of quacks can scarcely be imagined; for in coughs arising from suppressed perspiration, or an inflammatory diathesis, opiates generally do harm.'

Court plaster. Sticking plaster.—Black silk is strained and brushed over ten or twelve times with the following preparation: Dissolve half an ounce of gum benzoin in six fluid ounces of rectified spirit; in a separate vessel dissolve an ounce of isinglass in half a pint of water; strain each solution; mix them; and let them rest, so that the grosser parts may subside. When the clear liquor is cold it will form a jelly, which must be warmed before it is applied. When dry, in order to prevent its cracking, it is finished off with a solution of four ounces of Chio turpentine in six ounces of tincture of benzoin.

Crespigny (Lady) her pills, or lady Webster's pills. These popular pills are the pilulæ stomachicæ, vulgò pilulæ ante cibum of the Codex Medicamentarius Parisiensis. Editio quinta, A. D. 1758: viz. Take of best aloes six drachms, mastich and red rose of each two drachms, syrup of wormwood as much as will be sufficient to make a mass. The mass is divided into pills of three grains each.

Duffy's elixir. This is the tinctura sennæ composita, with the substitution of treacle for sugar candy, and the addition of aniseeds. Different kinds of this nostrum are sold under the names of Dicey's; but they differ principally in some subordinate minutiæ or unimportant additions.

Dalby's carminative. This consists of carbonate of magnesia two scruples, oil of peppermint one drop, of nutmeg two drops, of aniseed three drops, of the tinctures of castor thirty drops, of assafœtida fifteen drops, spirit of pennyroyal fifteen drops, of the compound tincture of cardamoms thirty drops, peppermint water two fluid ounces.

Dinner pills. See *Lady Crespigny's pills.*

Dixon's antibilious pills. Aloes, scammony, rhubarb, and tartarised antimony.

Dutch drops. The basis of this nostrum consists of the residue of a redistillation of oil of turpentine, which is a thick, red, resinous matter, to which the name of balsam of turpentine has been given: a preparation however is frequently vended as 'Dutch Drops', which is a mixture of oil of turpentine, tincture of guaiacum, spirit of nitric ether, with small portions of the oil of amber and cloves.

Eau medicinale. After various attempts to discover the active ingredients of this Parisian remedy, it is at length determined to be the colchicum autumnale, which several ancient authors, under the name of hermodactyls, have recommended in the cure of gout. The following is the receipt for preparing this medicine:—Take two ounces of the root of colchicum cut into slices, macerate it in four fluid ounces of proof spirit, and filter.

Essence of coffee. The pulp of cassia is said to form the basis of this article.

Essence of coltsfoot. This preparation consists of equal parts of the balsam of tolu and the compound tincture of benzoin, to which is added double the quantity of rectified spirit of wine.

Essence of mustard. (Whitehead.) This consists of oil of turpentine, camphor, and a portion of spirit of rosemary; to which is added a small quantity of flour of mustard.

Essence of mustard pills. Balsam of tolu with resin!

Essence of spruce. A fluid extract by decoction from the twigs of the species of fir called the pinus larix, producing the Venice turpentine, is the well known essence of spruce, which, when fermented with molasses, forms the popular beverage called spruce beer.

Essential salt of lemons. The preparation sold under this name for the purpose of removing iron moulds from linen consists of cream of tartar and superoxalate of potassa, or salt of sorrel, in equal proportions.

Friar's balsam is nothing more than the compound tincture of benzoin of the pharmacopœias.

Godfrey's cordial. The following receipt for this nostrum was obtained from a wholesale druggist, who makes and sells many hundred dozen bottles in the course of the year. There are, however, several other formulæ for its preparation, but not essentially different. Infuse nine ounces of sassafras, and of the seeds of carraway, coriander, and anise, of each one ounce, in six pints of water; simmer the mixture until it is reduced to four pints; then add six pounds of treacle, and boil the whole for a few minutes; when it is cold add three fluid ounces of the tincture of opium.

Golden ointment. Under this name is sold a preparation which consists of sulphuret of arsenic [orpiment] with lard or spermaceti ointment.

The unguentum hydrargyri nitrico-oxydi of the London college is also sold under the same title.

Gout tincture (Wilson's). This is merely an infusion of colchicum, as Dr. Williams of Ipswich has satisfactorily shown.

Gowland's lotion is a solution of sublimate in an emulsion formed of bitter almonds in the proportion of about a grain and a half to a fluid ounce.

Hooper's pills. Compound aloetic pill with myrrh (pil. rufi), sulphate of iron, and Canella bark.

James's powder. See the present article under the word *Pulvis antimonialis*.

James's analeptic pills. These consist of James's powder, gum ammoniacum, and the pill of aloes with myrrh (pil. rufi), equal parts, with a sufficient quantity of the tincture of castor to make a mass.

Norton's drops. A disguised solution of corrosive sublimate.

Opodeldoc (Steers's). Castile soap one ounce, rectified spirit eight ounces, camphor three ounces and a half, oil of rosemary half a fluid drachm, oil of origanum one fluid drachm, solution of ammonia six fluid drachms.

Oxley's concentrated essence of Jamaica ginger. A mere solution of ginger in rectified spirit.

Portland powder. Equal quantities of the roots of gentian and birthwort, the tops and leaves of germander, ground pine, and lesser centaury powdered and mixed together.

Riga balsam. From the shoots of the pinus cembra previously bruised, and macerated for a month in water. This same fir also affords Briançon turpentine.

Roche's embrocation. Olive oil mixed with about half its quantity of the oil of cloves and amber.

Ruspini's tincture. This consists of the root of the florentine iris eight ounces, cloves one ounce, rectified spirit two pints, ambergris one scruple.

Seidlitz powders. These consist of two different powders; the one contained in a white paper consists of two drachms of tartarised soda and two scruples of carbonate of soda; that in the blue paper of thirty-five grains of tartaric acid. The contents of the white paper are to be dissolved in half a pint of spring water, to which those of the blue paper are to be added; the draught is to be taken in a state of effervescence. The acid, being in excess, renders it more grateful and no less efficacious as a purgative.

Singleton's ointment. See *Golden ointment*.

Sodaic powders. Contained in two distinct papers, one of which is blue, the other white; that in the former consists of half a drachm of the carbonate of soda; that in the latter of twenty-five grains of tartaric acid. These powders require half a pint of water. It is very evident that a solution of these powders is by no means similar to soda water, which it is intended to emulate; for in this latter preparation the soda is in combination only with carbonic acid, whereas the solution of the sodaic powders is that of a neutral salt with a portion of fixed air diffused through it.

Spilsbury's antiscorbutic drops.—Of corrosive sublimate two drachms, prepared sulphuret of antimony one drachm, gentian root and orange peel equal parts two drachms, shavings of red sanders one drachm, made into a tincture with a pint of proof spirit. Digest and strain.

Stephen's (Mrs.), remedy for the stone consisted of lime in conjunction with an alkali.

Velno's vegetable syrup.—There is a great obscurity with respect to the genuine composition of this nostrum: it is supposed to consist of sublimate rubbed up with honey and mucilage. I have reason, however, to believe that it contains antimony, and the syrup of marsh mallows. Swediaur says that the volatile alkali enters into it as an ingredient: this alkali was proposed by Dr. Peyrile as a substitute for mercury, and it constitutes the active ingredient of a composition, proposed by Mr. Besnard, physician to the king of Bavaria.

Virgin's milk. A spirituous solution of benzoin, mixed with about twenty parts of rose water, forms a cosmetic long known by this name. A sulphate of lead is also sold under this name, which is prepared as follows:—To a saturated solution of alum add of Goulard's extract one third part. Shake them together.

Ward's paste for fistulas, piles, &c. Take of black pepper and elecampane, powdered, equal parts, half a pound; of the seeds of fennel a pound and a half; of honey and sugar equal parts, one pound; beat and well mix together all the ingredients in a mortar. Dose the size of a nutmeg three times a day.

Worm cakes (*Storey's*).—Calomel and jalap made into cakes and colored by cinnabar.

APPENDIX II.

TABLE.—Showing the proportions in which OPIUM, ANTIMONY, ARSENIC, and MERCURY are contained in some compound medicines. From THOMSON'S DISPENSATORY.

OPIUM.

Confectio opii. London.—Confection of opium. Thirty-six grains contain one grain of opium.

Electuarium opiatum. Edinburgh.—Opiate electuary contains in each drachm about one grain and a half of opium.

Pilulæ saponis cum opio. London.—Pills of soap and opium. Five grains contain one grain of opium.

Pilulæ opiatæ. Edinburgh.—Opiate (formerly Thebaic) pills. Each drachm contains six grains of opium. A pill of five grains contains half a grain of opium.

Pulvis cornu usti cum opio. London.—Powder of burnt hartshorn with opium. Ten grains contain one grain of opium.

Pulvis cretæ compositus cum opio. London.—Compound powder of chalk with opium. Two scruples contain one grain of opium.

Pulvis ipecacuanhæ compositus. London.—Compound powder of ipecacuanha. Ten grains contain one grain of opium.

Pulvis kino compositus. London—Compound powder of kino. Each scruple contains one grain of opium.

Tinctura opii. London.—Tincture of opium. Nineteen minims contain one grain of opium.

Tinctura opii. Edinburgh.—Tincture of opium is made with two scruples of opium in each ounce of liquid, or each drachm should contain five grains. But one drachm of the tincture when evaporated yields only three grains and a half of opium.

Tinctura camphoræ composita. London.—Compound tincture of camphor. *Tinctura opii camphorata.* Edinburgh.—Half a fluid ounce contains nearly one grain of opium.

Tinctura opii ammoniata. Edinburgh.—Ammoniated tincture of opium is made with about eight grains of opium in each ounce of liquid, or each drachm should contain nearly one grain of opium.

Tinctura saponis et opii. Edinburgh.—Tincture of soap and opium is made with one scruple of opium in each ounce of the liquid.

Trochisci glycyrrhizæ cum opio. Edinburgh.—Troches of liquorice with opium. Each drachm contains nearly one grain of opium.

ANTIMONY.

Vinum antimonii tartarizati. London.—Solution of tartarised antimony, contains in each fluid ounce two grains of tartarised antimony.

Vinum tartritis antimonii. Edinburgh.—Wine of tartrate of antimony contains in each ounce two grains of tartrate of antimony.

MERCURY.

Emplastrum hydrargyri. Edinburgh.—Mercurial plaster. Each drachm contains about sixteen grains of mercury (fifteen London).

Hydrargyrum cum cretâ. London.—Mercury with chalk. Three grains contain one grain of mercury.

Liquor hydrargyri oxymuriatis. London.—Solution of oxymuriate of mercury. Two fluid ounces contain half a grain of oxymuriate of mercury.

Linimentum hydrargyri. London.—Mercurial ointment. Six drachms contain one drachm of mercury.

Pilulæ hydrargyri. London.—Mercurial pills. Three grains contain one grain of mercury.

Pilulæ hydrargyri. Edinburgh.—Mercurial pills. Each drachm contains fifteen grains of mercury. Each five grain pill contains one and one-fourth grain of mercury.

Pilulæ hydrargyri submuriatis compositæ. London. Edinburgh.—Pills of submuriate of mercury. About four grains contain one grain of submuriate of mercury.

Unguentum hydrargyri fortius. London.—Stronger mercurial ointment. Two drachms contain one drachm of mercury.

Unguentum hydrargyri mitius. London.—Weaker mercurial ointment. Six drachms contain one drachm of mercury.

Unguentum hydrargyri. Edinburgh.—Mercurial ointment. Each drachm contains twelve grains of mercury: made with double the quantity of mercury, each drachm contains twenty grains.

Unguentum nitratis hydrargyri fortius. Edinburgh.—Stronger ointment of nitrate of mercury. Each drachm contains four grains of mercury.

Unguentum nitratis hydrargyi mitius. Edinburgh.—Milder ointment of nitrate of mercury. Each scruple contains half a grain of mercury.

Unguentum oxidi hydrargyri cinerei. Edinburgh.—Ointment of the gray oxide of mercury. Each drachm contains fifteen grains of the oxide.

Unguentum oxidi hydrargyri rubri. Edinburgh.—Ointment of red oxide of mercury. Each drachm contains seven grains of the oxide.

ARSENIC.

Liquor arsenicalis. London.—*Solutio arsenicalis.* Edinburgh.—Arsenical solution. One fluid ounce contains four grains of white sublimed arsenic.

APPENDIX III.

WEIGHTS AND MEASURES.

(Extracted from Mr. Gray's Supplement to the Pharmacopœia, a most useful work, and from which we had contemplated much extract; but our limits being already trespassed upon, and not being able to do justice to our original design in reference to this work without very considerable enlargement of the article, we must content ourselves with recommending the possession of this book to such of our readers as are curious to learn, not only the drugs and compounds which are used by practitioners of medicine, but also 'most of those which are used in the chemical arts, or which undergo chemical preparation,' &c. Many of these have of course, and will further fall under notice in the prosecution of our own labors; but we think Mr. Gray has been most meritoriously employed in collecting a mass of information into one volume, of which we repeat our recommendation).

Medicines, except a few hereafter mentioned, were formerly sold, and the prescriptions of physicians made up, by the common English weight, called avoirdupois. The ounce of that weight being then, as appears by all the old authors on arithmetic, subdivided into eight drachms, twenty-four scruples, and 480 English grains; the medical pound differing from the common by its containing only twelve ounces, while the troy ounce had for its fractions pennyweights and troy grains. The College of Physicians having at length, in the 1720 edition of the Pharmacopœia, ordered the drachms, scruples, and grains to be adjusted to the troy ounce, hence, as the dispensers of medicines were the only persons who used these small weights, those adjusted to the avoirdupois ounce went out of use, and were no longer made, and the quarter-ounce was the smallest avoirdupois weight in common use, as it still continues; but as the Italian rotolo for raw silk has been adjusted to the avoirdupois weight, and made twenty-four ounces a pound; a smaller weight, the Spanish adarme, equal to the sixteenth part of the avoirdupois ounce, was used under the name of a dram, for weighing silk, and this has now become an established fraction of this ounce, but it is scarcely used by any other persons than haberdashers, and, for all weights less than the quarter of an ounce troy, apothecaries' weights are employed, although as the avoirdupois pound is established by statute at 7000 troy grains, the quarter ounce containing 109 grs. 375, and the drachm 27, gr. 34375, are most inconvenient numbers for reduction.

TABLE OF AVOIRDUPOIS WEIGHT.

Commercial Fractions.		Troy Grains.	Decimal Fractions.
1 pound		7000·	1·0000
15 ounces		6562·50	0·9375
14 ——		6125·00	0·8750
13 ——		5687·50	0·8125
12 ——	or ¾ po'	5250·00	0·7500
11 ——		4812·50	0·6875
10 ——		4375·00	0·6250
9 ——		3937·50	0·5625
8 ——	or ½ po'	3500·00	0·5000
7 ——		3062·50	0·4375
6 ——		2625·00	0·3750
5 ——		2187·50	0·3125
4 ——	or ¼ po	1750·00	0·2500
3 ——		1312·50	0·1875
2 ——		875·00	0·1250
1 ——		437·50	0·0625=1·0000
15 drachms		410·16	0·0586=0·9375
14 ——		382·81	0·0547=0·8750
13 ——		355·47	0·0508=0·8125
12 ——	or ¾ oz.	328·13	0·0469=0·7500
11 ——		300·78	0·0430=0·6875
10 ——		273·44	0·0391=0·6250
9 ——		246·09	0·0352=0·5625
8 ——	or ½ oz.	218·75	0·0313=0·5000
7 ——		191·41	0·0273=0·4375
6 ——		164·06	0·0234=0·3750
5 ——		136·72	0·0195=0·3125
4 ——	or ¼ oz.	109·35	0·0156=0·2500
3 ——		82·03	0·0117=0·1875
2 ——		54·69	0·0078=0·1250
1 ——		27·34	0·0039=0·0625
½ ——		13·67	0·0019=0·0313

APOTHECARIES' WEIGHT.

A few choice articles of the Materia Medica, as lapis bezoar, seed pearl, white amber, balm of Mecca, oil of cinnamon, and some electuaries, high in popular estimation, and imported from Italy, as Venice treacle and orvietan, were always weighed by the troy ounce, and its subdivisions into pennyweights and grains, and still pay duties at the custom-house by that weight, as may be seen in the book of rates. But it was not until the directions given in the London Pharmacopœia, edition of 1720, that the troy ounce was divided into the same fractions of drachms, scruples, and grains, as the avoirdupois, for the purpose of dispensing all such drugs as were ordered by weight. This alteration must have been and is still productive of very great confusion, by obliging the same person to have two sets of weights,—one for buying and selling, the other for preparing the officinal preparations and compounds, and for making up prescriptions. It does not clearly appear why this alteration was made in respect only to drugs ordered by weight, by which their proportion in the officinal preparations and compositions was increased one-tenth; as the avoirdupois ounce, with its old divisions into eight drachms, and drops, sixty of which were presumed equal to the drachm, was, and is still retained, in respect to drugs that are dispensed by measure.

TABLE OF APOTHECARIES' WEIGHT.

Usual Fractions.		Troy Grains.	Decimal Fractions.
1 pound		5760	1·0000
11 ounces		5280	0·9167
10 ——		4800	0·8333
9 ——	or ¾ lb.	4320	0·7500
8 ——		3840	0·6667
7 ——		3360	0·5833
6 ——	or ½ lb.	2880	0·5000
5 ——		2400	0·4167
4 ——		1920	0·3333
3 ——	or ¼ lb.	1440	0·2500
2 ——		960	0·1667
1 ——		480	0·0833=1·0000
7 drachms		420	0·0729=0·8750
6 ——		360	0·0625=0·7500
5 ——		300	0·0521=0·6250
4 ——	or ½ ounce	240	0·0417=0·5000

Usual Fractions.	Troy Grains.	Decimal Fractions.
3 ——	180	0·0315=0·3750
2 ——	120	0·0208=0·2500
1 ——	60	0·0104=0·1250
2 scruples	40	0·0070=0·0833
½ dram	30	0·0052=0·0625
1 scruple	20	0·0035=0·0416
½ scruple	10	0·0017=0·0212
	5	0·0008=0·0106
	3	0·0005=0·0062
	2	0·0003=0·0041
	1	0·0002=0·0021

As apothecaries or chemists seldom keep troy weight beyond four or eight ounces, the relation between the apothecary or troy pounds and ounces and the common weight is often required in preparing the officinal preparations, and is here given; the quarter ounce being used instead of the avoirdupois drachm, as the latter weight is seldom or never kept by chemists or dispensers.

Troy or Apothecary Pounds.		Avoirdupois. lb.	oz.	qr.	grains.
100	=	82	4	2	31·250
50	=	41	2	1	15·625
30	=	24	10	3	96·875
20	=	16	7	1	28·125
10	=	8	3	2	68·749
5	=	4	1	3	34·375
3	=	2	7	1	108·125
2	=	1	10	1	35·625
1	=		13	0	72·500

Apothecary Weight.		Avoirdupois. oz.	qr.	grains.
℥ix	=	9	3	54·375
℥vj, or lbß	=	6	2	36·250
℥iij	=	3	1	18.125
℥ij	=	2	0	85·000
℥j	=	1	0	42·500
ʒiv, or ℥ß	=		2	21·250
ʒij	=		1	10·625

Although the quarter ounce is only 109 grains ·375, it will be convenient in adding two or more of these reductions together to take the even 110 grains as its value.

The Scotch pound trone is equal to 9600 grains Scotch troy weight, or 9527 grains English ·25: the Scotch Dutch troy pound is equal to 7680 Scotch grains, or 7620 grains English ·8: both pounds are divided into sixteen ounces, the ounce Dutch equal to 476 grains English ·3.

Besides the regular weights, articles are sometimes quoted by the weight of seeds or kernels, as the weight of a nutmeg, or of so many black pepper corns. In India they use the paddy weight, or that of the grains of rough rice, each of which is equal to about 2-5ths of a grain; the gulivindum weight, or that of a jumble bead, equal to about one grain $\frac{5}{16}$; the retti weight, equal to about two grains $\frac{2}{16}$. Gold coins are sometimes used, as the gold fanam weight equal to eight grains; the star pagoda weight equal to about eighty-four grains.

MEASURES.

In the old editions of the London Pharmacopœia the liquids were compounded by avoirdupois weight; and the following terms were used for expressing a determinate number of ounces.

The Cyathus, or cup	for	1 oz½
Hemina, or cotyle	—	9 oz
Libra, or pint	—	12 oz
Sextarius, or ⅙ of a congius	—	18 oz
Congius, or gallon	—	108 oz

In 1720, when the Pharmacopœia was improved by Sir Hans Sloane and Dr. Quincy, the liquids were ordered by measure, and the gallon adopted by the London College was that just enacted for wine and spirituous liquors, containing 231 cubic inches, divided into eight pints; they divided the pint, which holds sixteen avoirdupois ounces, ten drachms, seventeen grains of water, into sixteen ounces, and these into eight drachms. Smaller quantities were ordered by drops, supposed to be equal to grains; but now the dram measure is divided into sixty minims, and graduated tubes used to measure them, so that the old divisions of the avoirdupois ounce were, and are still retained in respect to liquids.

Aëriform fluids are measured by cubic inches.

The relation between wine measure, with the college divisions, and cubic inches, is thus expressed.

Wine and Medical Measure.	Cubic 1000th inches. parts.
10 gallons	2310·000
5 ——	1155·000
3 ——	693·000
2 ——	462·000
1 ——	231·000
½ gallon, or four pints	115·500
2 pints	57·750
1 pint	28·875
¾ pint, or twelve ounces medical measure	21·645
½ pint, or eight ounces	14·437
¼ pint, or four ounces	7·218
2 ounces	3·609
1 ounce	1·804
6 drachms	1·353
4 ——	0·902
2 drachms	0·451
1 drachm	0·225
½ drachm, or thirty minims	0·112
20 minims	0·056
10 ——	0·037
5 ——	0·018
3 ——	0·011
2 ——	0·007
1 ——	0·003
Scotch gill	6·462
—— mutchken	25·85
—— choppen	51·7
—— pint	103·4
—— quart	206·8
—— gallon	827·23

The Scotch pint is equal to forty-one ounces trone of Tay water, or fifty-five ounces troy of Leith water; specific gravity of Tay water 100, of Leith water 103.

Ale and beer measure is seldom mentioned by medical or chemical writers; the gallon contains 282 cubic inches; thirty-two gallons are a London barrel of ale, thirty-four a country barrel of either ale or beer, and thirty-six a London barrel of beer. Nor is dry measure often used; the Winchester bushel, of eight gallons, measures 2150 cubic inches ·4, or one cubic foot ·822, and the quarter eight bushels.

The imperial gallon, lately added to the others in use, is established by the weight of distilled water it will hold at 62° Fahrenheit, the barometer standing at thirty inches.

The gallon is to hold ten avoirdupois pounds of water, and must consequently measure 277 cubic inches ·274.

The pint is to hold twenty avoirdupois ounces, and should of course measure thirty-four cubic inches ·659.

The avoirdupois ounce measure of water is therefore one cubic inch ·73298.

The troy ounce of water measures one cubic inch ·9013214.

The weight of a cubic inch of water is 252 grains ·456; and that of a cubic foot is sixty-two avoirdupois pounds ·3206.

A cubic foot of air, or 1728 cubic inches, weighs 528 troy grains ·367, or one avoirdupois ounce, three drachms, eight grains ·23.

Besides these measures, other irregular measures of uncertain content, are used:—

A table spoonful, cochlearium magnum, of syrup ℥ß.
of distilled waters ʒiijß to ℥ß.
of spirits and tinctures ʒij to ʒiij.

A dessert spoonful, cochlearium mediocre, of water ʒij.

A tea or coffee spoonful, cochlearium parvum, of syrup ʒj to ʒij.
of distilled waters ℈jß to ℈ij.
of spirit and tinctures ℈j to ℈jß.
of a light powder, as magnesia, ℈ß to ℈j.
of a heavy powder, as sulphur, ℈jß to ℈ij.
of a metallic oxide ʒj to ℈iiij.

A thimbleful, clypeola metallica pro digitis, is usually the same as a tea spoonful.

A tea-cup, vasculum pro theâ, ℥iij to ℥iv.

A wine glass, scyphus pro vino, cyathus, ℥jß.

APPENDIX IV.

A List of ABBREVIATIONS taken from the PUPIL'S PHARMACOPŒIA by MR. MAUGHAM. An exceedingly useful publication for medical students whose knowledge of Latin is not extensive.

A. or *āā.*—ἀνὰ, *ana*, signifies *of each*. It is placed after two or more substances, thus:—

℞. Tincturæ lavandulæ,
——— cinnamoni, *āā* ʒij.

i. e. take of tincture of lavender, and of tincture of cinnamon, of each two drachms.

Abdom.—Abdōmen, *the belly*.

Abs. febr.—Absente febre, *the fever being absent*.

Ad 2 vic.—Ad duas vices, *at two takings*.

Ad gr. acid.—Ad gratam aciditātem, *to an agreeable acidity*.

Ad libit.—Ad libĭtum, *at pleasure*.

Add.—Adde, *add*; addantur, *let them be added*; addendus, *to be added*.

Admov.—Admoveātur, *let it be applied*; admoveantur, *let them be applied*.

Adst. febre—Adstante febre, *the fever being present*.

Aggred. febre—Aggredĭente febre, *the fever coming on*.

Altern. horis—Alternis horis, *at every other hour*.

Alvo adst.—Alvo adstricto, *the belly or bowels being bound*.

Aq. bull.—Aqua bullĭens, *boiling water*.

Aq. ferv.—Aqua fervens, *boiling water*.

Bis ind.—Bis indies, *twice daily*.

BB. Bbds.—Barbadensis, *Barbadoes*.

Bull.—Bullĭat, *let it boil*; bullĭant, *let them boil*.

Cærul.—Cærulĕus, *blue*.

Cap. or *Capt.*—Capiat, *let him take*, [*i. e.* let the patient take.]

C. m.—Cras manè, *to-morrow morning*.

Coch. ampl.—Cochleāre amplum, *a large spoonful*.

Coch. infant.—Cochleāre infantis, *a child's spoonful*.

Coch. magn.—Cochleāre magnum, *a large spoonful*.

Coch. mod.—Cochleāre modicum, *a middling-sized spoonful*, i. e. *a dessert spoonful*.

Coch. parv.—Cochleāre parvum, *a little spoonful*, *a tea-spoonful*.

Col.—Colātus, *strained*.

Colat.—Colātur, *let it be strained*.

Colat.—Colaturæ, *of* or *to the strained* [liquor.]

Colent.—Colentur, *let them be strained*.

Comp.—Composĭtus, *compound*.

Cont. rem.—Continuentur remedia, *let the medicines be continued*.

Coq.—Coque, *boil*; or, coquantur, *let them* [i. e. *the ingredients*] *be boiled*.

Crast.—Crastĭnus, *of to-morrow*.

Cuj.—Cujus, *of which*.

Cujusl.—Cujuslibet, *of any*.

Cyath. theæ—Cyătho theæ, *in a cup of tea*.

Deb. spiss.—Debĭta spissitūdo, *a proper consistence*.

Decub.—Decubĭtus, *lying down*.

De d. in d.—De die in diem, *from day to day*.

Dej. alvi—Dejectĭones alvi, *throwings down of the bowels,—stools*.

Det.—Detur, *let it be given*; dentur, *let them be given*.

Dieb. alt.—Diebus alternis, *every other day*.

Dieb. tert.—Diebus tertiis, *every third day*.

Dim.—Dimidius, *one half*.

Dir. prop.—Directiōne proprĭâ, *with a proper direction*.

Donec alv. bis dej.—Donec alvus bis dejiciātur, *until the bowels are twice moved*.

Donec alv. sol. fuer.—Donec alvus solūta fuĕrit, *until the bowels shall have become relaxed*.

Ejusd.—Ejusdem, *of the same*.

Enem.—Enĕma, *a clyster*; plural, enemăta, *clysters*. It is derived from the Greek ἐνιημι, *to inject*, and is of the neuter gender.

Ext. sup. alut.—Extende super alūtam, *spread upon leather*.

F. pil. xij.—Fac pilŭlas duodĕcim, *make twelve pills*.

Feb. dur.—Febre durante, *during the fever*.

Fem. intern.—Femorĭbus internis, *to the inner part of the thighs*.

Ft. embrocat.—Fiat embrocatĭo, *let an embrocation be made*.

Ft. gargar.—Fiat gargarismus, *let a gargle be made*.

Ft. haust.—Fiat haustus, *let a draught be made*.

Ft. mist.—Fiat mistūra, *let a mixture be made*.

Ft. pil. xij.—Fiant pilŭlæ duodĕcim, *let twelve pills be made*.

Ft. pulv.—Fiat pulvis, *let a powder be made.*
Ft. or *F. venæs.*—Fiat venæsectio, *let bleeding be performed.*
Fist. arm.—Fistŭla armata, *a prepared pipe,* i. e. *a clyster-pipe and bladder prepared for use.*
Fl.—Fluĭdus, *liquid.*
Gel. quav.—Gelatĭnâ quâvis, *in any sort of jelly.*
G. G. G.—Gummi guttæ Gambĭæ, *Gamboge drops.*
Gr.—Granum, *a grain*; or grana, *grains.*
Gtt.—Gutta, *a drop*; or guttæ, *drops.*
Gutt. quibusd.—Guttis quibusdam, *with a few drops.*
Har. pil. sum. iij.—Harum pilulārum sumantur tres, *let three of these pills be taken.*
Hor. decub.—Horâ decubĭtus, *at the hour of lying down*, i. e. *at going to bed.*
Hor. som.—Horâ somni, *at the hour of sleep*, i. e. *at bed-time.*
Hor. un. spatio—Horæ unĭus spatĭo, *at the expiration of an hour.*
Hor. interm.—Horĭs intermedĭis, *at intermediate hours.*
Ind.—Indies, *daily.*
In pulm.—In pulmento, *in gruel.*
Inj. enem.—Injiciātur enĕma, *let a clyster be given.*
Lat. dol.—Latĕri dolenti, *to the affected side.*
M.—Misce, *mix*; also mensurâ, *by measure*; and manipŭlus, *a handful.*
Manè pr.—Manè primo, *early in the morning.*
Min.—Minĭmum, *the sixtieth part of a fluid drachm.*
Mitt.—Mitte, *send*; mittatur *let it be sent*; mittantur, *let them be sent.*
Mitt. sang. ad ℥xvj. saltem.—Mittātur sanguis ad uncĭas sedĕcim saltem, *let blood be taken away to sixteen ounces at least.*
Mod. præsc.—Modo præscripto, *in the manner prescribed.*
Mor. sol.—More solĭto, *in the usual manner.*
N.—Numero, *in number.*
N. M.—Nux moschata, *a nutmeg.*
O.—Octarius, *a wine pint.*
Ol. lini s. i.—Olĕum lini sine igne, *linseed oil without fire,* [i. e. *cold drawn.*]
Omn. bid.—Omni biduo, *every two days.*
Omn. bih.—Omni bihorio, *every two hours.*
Omn. hor.—Omni horâ, *every hour.*
Omn. man.—Omni mane, *every morning.*
Omn. noct.—Omni nocte, *every night.*
Omn. quadr. hor.—Omni quadrante horæ, *every quarter of an hour.*
Oz.—*The ounce avoirdupois weight.*
P.—*Pondo by weight.*
P. Æ.—Partes æquāles, *equal parts.*
P. D.—Pharmacopœia Dublinensis, *pharmacopœia of Dublin.*
P. E.—Pharmacopœia Edinensis, *pharmacopœia of Edinburgh.*
P. L.—Pharmacopœia Londinensis, *pharmacopœia of London.*
Part, viç.—Partĭtis vicĭbus, *in divided doses.*
Per. op. emet.—Peracta operatĭone emetĭci, *the operation of the emetic being finished.*
Post sing. sed. liq.—Post singulas sedes liquidas, *after each liquid or loose stool.*
P. r. n.—Pro re natâ, *occasionally* [i. e. *according to circumstances.*]
P. rat. æt.—Pro ratĭone ætātis, *according to the state of age* [i. e. *according to the age of a person.*]
P. or *Pug.*—Pugillus. This word in Pliny signifies *a handful*, but it is intended to denote *a gripe between the finger and thumb.*
Q. P.—Quantum placet, *as much as you please.*
Q. s.—Quantum sufficiat, *as much as may be sufficient.*
Qqe. hor.—Quâque horâ, *at every hour.*
Quor—Quorum, *of which.*
℞.—Recipe, *take.*
Red. in pulv.—Redactus in pulvĕrem, *reduced to powder.*
Redig. in pulv.—Redigātur in pulvĕrem, *let it be reduced to powder*
Reg. umbil.—Regio umbilĭci, *the region of the navel* [i. e. *the parts about the navel.*]
Repet.—Repetātur, *let it be continued*; or repetantur, *let them be continued.*
S. A.—Secundum artem, *according to art.*
Semidr.—Semidrachma, *half a drachm.*
Semih.—Semihōra, *half an hour.*
Sesunc.—Sesuncĭa, *an ounce and a half.*
Sesquih.—Sesquihōra, *an hour and a half.*
Si n. val.—Si non valeat, *if it should not answer.*
Si op. sit—Si opus sit, *if there should be occasion.*
Si vir. perm.—Si vires permittant, *if the strength permit.*
Sign. n. pr.—Signetur nomĭne proprĭo, *let it be marked with the proper name*; as, *Tincture of lavender*, instead of *Tinctura lavandulæ*, &c.
Ss.—Semi, *half.*
St.—Stet, *let it stand*; or stent, *let them stand.*
Sub fin. coct.—Sub finem coctiōnis, *towards the end of boiling* [i. e. *when boiling is just finished.*]
Sum. tal.—Sumat talem, *let him* [i. e. *the patient*] *take such as this.*
S. V.—Spirĭtus vinōsus, *ardentspirit.*
S. V. R.—Spirĭtus vinōsus rectĭficātus, *rectified spirit of wine.*
S. V. T.—Spirĭtus vinōsus tenuis, *weak spirit of wine* [i. e. *proof spirit*; *half spirit of wine, and half water.*]
Temp. dext.—Tempori dextro, *to the right temple.*
Temp. sinist.—Tempori sinistro, *to the left temple.*
T. O.—Tinctūra opii, *tincture of opium.*
T. O. C.—Tinctūra opĭi camphorāta, *camphorated tincture of opium—paregoric.*
Ult. præsc.—Ultimo præscriptus, the *last prescribed.*
V. O. S.—Vitello ovi solutus, *dissolved in the yolk of an egg.*
Vom. urg.—Vomitiōne urgente, *the vomiting taking place* [i. e. *when the vomiting begins.*]
Zz.—Zinziber, *ginger.*

INDEX.

As the articles in the Pharmacopœia, like those in the Materia Medica, are all arranged alphabetically, it would be a useless repetition to add an alphabetic index; we merely, therefore, present a list of the order in which the subjects are treated.

PHARMECUSA, an island in the Ægean Sea, where Julius Cæsar was seized by pirates.

PHARMUTHI, in the ancient Egyptian chronology, one of the months of their year, answering to April in the Roman kalendar.

PHARNABAZUS, the son of Pharnabazus, a satrap of Persia, and a general under Artaxerxes Longimanus. See PERSIA. He betrayed the celebrated Alcibiades to his enemies. He flourished about A. A. C. 409.

PHARNACE, a town of Pontus.

PHARNACES, the favorite son of Mithridates the Great, king of Pontus, who ungratefully rebelled against him, and caused him to kill himself. He was defeated by Cæsar, in the expeditious battle of which he wrote home to Rome, Veni, Vidi, Vici. Pharnaces was afterwards killed in another battle with the Romans. See PONTUS.

PHARNACEUM, in botany, a genus of the trigynia order, belonging to the pentandria class of plants; and in the natural method ranking under the twenty-second order, caryophylleæ.

PHARNAPATES, a general of the Parthians, under Orodes, who was killed in battle by the Romans.

PHARNUS, a king of Media, who was conquered by Ninus king of Assyria.

PHA'ROS, *n. s.* } From Pharos in Egypt.
PHARE. } A light-house; a lantern on the shore to direct ships.

He augmented and repaired the port of Ostia, built a *pharos* or light-house. *Arbuthnot on Coins.*

PHAROS is a pile or erection raised near a port, where fire is kept burning in the night, to direct vessels near at hand. The Pharos of Alexandria, built in the island of Pharos at the mouth of the Nile, was anciently very famous, insomuch as to communicate its name to all the rest. This most magnificent tower consisted of several stories and galleries, with a lantern at top, in which a light being continually burning, might be seen 100 miles off. It was accounted one of the seven wonders of the world. It was built by the architect Sostrates, a native of Cnidos, or, according to some, Deiphanes, the father of Soctrates; and cost Ptolemy Philadelphus 800 talents. The several stories were adorned with columns, balustrades, and galleries of the finest marble and workmanship; to which some add, that the architect had contrived to fasten some looking-glasses so artificially against the highest galleries that one could see in them all the ships that sailed on the sea for a great way. Instead of this noble structure, there is now only an irregular castle, without ditches or outworks of any strength, out of which rises a tower, which serves for a light-house, but has nothing of the beauty and grandeur of the old one. The Colossus of Rhodes also served as a pharos.

PHAROS, in ancient geography, a small oblong island adjoining the continent of Egypt, over against Alexandria. On account of the port of Alexandria, the entrance to which was difficult and dangerous, the Pharos was called the key of Egypt, or of the Egyptian sea (Lucan); and Pharos, from being a proper name, is become an appellative to denote all light-houses from the magnificent building of that description on the island. It stood upon four crabs of glass.

PHAROS, an island on the coast of Illyricum, now Lesina.

PHARPAR, or PHARPHAR, one of the rivers of Damascus, or rather an arm of the Barrady or Chrysorrhoas, which waters Damascus and the country about it. 2 Kings v. 12. The river of Damascus has its fountain in the mountains of Lebanus. At its approach to the city it is divided into three arms, one of which passes through Damascus. The other two water the gardens round about, and then, reuniting, they lose themselves at four or five leagues from the city, towards the north. See Maundrell's Travels from Aleppo to Jerusalem; also the articles ABANA and DAMASCUS.

PHARSALIA, an epic poem, composed by Lucan on the civil war between Pompey and Cæsar, and particularly on the victory of the latter over the former. It is a poem universally acknowledged to have both great beauties and great defects; but we are the less capable of estimating its merit as a whole, that either time has deprived us of the last books, or its author has left it incomplete.

PHARSALIA or PHARSALIUM, PHARSALOS or PHARSALUS, a town of Phthiotis, a district of Thessaly, near Pheræ and Larissa, now Farsa, to which last place Pompey fled from the plains of Pharsalus. It is watered by the Enipeus, which falls into the Apidanus, and both into the Peneus. Between Pharsalus and Enipeus Pompey drew up his men at the fatal battle of Pharsalia. At the commencement of this battle the whole plain was covered, from Pharsalia to the Enipeus, with two armies, dressed and armed after the same manner, and bearing the same ensigns. At first both kept a mournful silence; but at length the trumpets sounded, and Cæsar's army advanced to begin the attack, when Caius Crastinus, a centurion, at the head of 120 men, threw himself upon the enemy's first line with incredible fury, and made a great slaughter of them. But while he was still pressing forward, forcing his way through the first line, one of Pompey's men ran at him with such violence that the point of his sword, piercing him in the mouth, came out at the hind part of his neck. Pompey's soldiers then took courage, and stood the enemy's onset. While the foot were thus sharply engaged in the centre, Pompey's horse in the left wing marched up, and, having widened their ranks with a design to surround Cæsar's right wing, charged his cavalry, and forced them to give ground. Hereupon Cæsar ordered his horse to retreat a little, and give way to the six cohorts, which he had posted in the rear as a body of reserve. These, upon a signal, coming up, charged the enemy's horse with determined resolution, aiming only at the faces of the enemy. This new manner of fighting had the desired effect. For the young patricians, whom Cæsar called the young dancers, not willing to have their faces deformed with scars, turned their backs, and fled in the utmost confusion, leaving the foot at the mercy of the enemy. Cæsar's men did not pursue them; but, charging the foot, now naked and unguarded, surrounded them, and cut most of them to pieces. Pompey was so transported with rage at seeing the flower of his forces thus cut in pieces, that he left his army, and retired slowly to his tent, without speaking a word, and continued there, like one distracted, till his whole army was defeated. Cæsar no sooner saw himself master of the field than he marched to attack Pompey in his entrenchments; upon which the latter stole out at the decuman gate, and took the road to Larissa, which city had hitherto shown great attachment to him, but where he was now murdered; though some say this happened at Pelusium. (See POMPEY.) In the mean time Cæsar began the attack on the enemy's camp, which was vigorously defended by the cohorts Pompey had left to guard it; but they were at length forced to yield. Cæsar was not a little surprised when, after having forced the entrenchments, he found the enemy had made preparations beforehand for a festival after the victory, which they thought certain. In Pompey's tent Cæsar found the box in which he kept his letters; but, with a magnanimity worthy of himself, he burnt them all, without reading one; saying that he had rather be ignorant of crimes than obliged to punish them. The next day, when the dead were numbered, it appeared that Cæsar had scarcely lost 200 men; among whom were about thirty centurions, whom he caused to be buried with great solemnity. He paid particular honors to the body of Crastinus, and ordered his ashes to be deposited in a tomb. On Pompey's side the number of the dead amounted to 15,000 according to some, and to 25,000 according to others. Cæsar took 24,000 prisoners, eight eagles, and 180 ensigns.

PHARSALUS, or PHARSALIA, an extensive plain of Thessaly, between the above town and the Enipeus, in which the decisive battle above-mentioned was fought.

PHARUS, in botany, a genus of the hexandria order, belonging to the monœcia class of plants; and in the natural method ranking under the fourth order, gramina. The male calyx is a bivalved uniflorous glume; the corolla a bivalved glume; the female calyx the same with the male; the corolla a uniflorous, long, and wrapping glume. There is but one seed.

PHARUSII, or PHAURUSII, an ancient nation of Africa, beyond Mauritania.

PHARYBUS, a river of Macedonia, which runs into the Ægean Sea; by some called Baphyrus.

PHARYCADON, an ancient town of Macedonia, on the Peneus.

PHARYGE, an ancient town of Locris.

PHARYNGOTOMY, *n. s.* Gr. φαρυγξ and τεμνω, to cut. An incision into the pharynx or wind pipe, made when some tumor in the throat hinders respiration.

PHARNYX. See ANATOMY, Index.

PHARZA, or FARSA, a town of European Turkey in Janna, the ancient Thessaly, anciently called Pharsalia, fourteen miles south of Larissa. See FARSA and PHARSALIA.

PHASCUM, in botany, a genus of the order of musci, belonging to the cryptogamia class of plants. The anthera is operculated, with a ciliated mouth; the calyptræ are minute.

PHASE, or PHASIS. See PHASIS.

PHASELIS, an ancient town of Pamphylia, much frequented by pirates.

PHASELS. Lat. phaseoli. French beans.—Ainsworth. See PHASEOLUS.

PHASEOLUS, the kidney-bean; a genus of the decandria order, belonging to the diadelphia class of plants, and in the natural method ranking under the thirty-second order, papilionaceæ. Linnæus enumerates fifteen species. Of these, one comprehends many varieties. Those principally cultivated for the table are, 1. The common white, or Dutch kidney-bean; 2. The smaller kidney-bean, called the Battersea kidney-bean; and, 3. The upright sort, called the tree kidney-bean. 1. The first sort was some time ago propagated in England, and is still in Holland; it grows very tall, and requires long stakes and poles to climb on, and its beans are considerably broad; this makes them less saleable in the markets, people supposing them to be old because they are broad; and they are hence grown into disuse, though a much more valuable kind for eating than any other. 2. The Battersea bean is what is more universally cultivated: it never grows very tall, nor rambles far, and the air can easily pass between the rows, because of its moderate growth; this makes it bear plentifully, and ripen well for the table. It is the best tasted bean, except the last. 3. The tree kidney-bean is also a plentiful bearer, and never rambles, but grows up in form of a shrub; but its beans are broader than the Battersea kind, and are not so well tasted. They are all propagated from seeds, which are to be put into the ground in the end of March or beginning of April for an early crop; but they should have a warm situation and a dry soil; and be planted in a dry season. The manner of planting them is to draw lines with a bough over the bed, at three feet and a half distance, into which the seeds are to be dropped about two inches asunder; and the earth is to be drawn over them with the head of a rake, to cover them about an inch deep. In a week after sowing the plants will appear, and the earth should be drawn up about their stalks as they rise up; for a few days after this they will require no farther care except to be kept clear from weeds, and, when the beans appear, to have them gathered twice a-week; for, if the beans are suffered to hang on too long, they not only become of no value, but they weaken the plant. The first crop of kidney-beans will continue a month in good order; and, to supply the table afterwards, there should be fresh sowings in March, April, May, and June; the last of which will continue till the frosts come to destroy them. Some raise their early crops on hot beds; and this is to be done exactly in the same manner as the raising the early cucumbers.

PHASEOLUS, a species of phaseolus, apparently a very useful one, has been discovered by M. Moraney, 'an inhabitant of Morne-Rouge, dependent on the Cape;' we suppose Cape François of the island of St. Domingo. It requires no peculiar management: its roots are in season when the pods blacken, and its fibres run in every direction, searching for nourishment through the clefts of rocks, and receiving the impression of the strata without injury. If the principal root is left, the plant shoots again and flourishes as before; but it is not yet ascertained whether it puts forth any new roots. The seeds are not alimentary when dressed, as if nature designed them only for propagating other plants. Every use which a farinaceous plant can supply this new phaseolus has successfully answered.

PHASIANIA, in ancient geography, a country of Asia, seated on the banks of the PHASIS.

PHASIANI, the people of Phasiana. They were originally from Egypt.

PHASIANUS, in ornithology, a genus of birds belonging to the order of gallinæ. The cheeks are covered with a smooth naked skin. Gibbon, in his Roman History, tells us that the name phasianus is derived from the river Phasis, the banks of which are the native habitation of the pheasant. There are many species and varieties.

1. P. argus is yellowish, with black spots, a red face, and a blue crest on the back of the head. It is found in Chinese Tartary. 'The Argus,' says Latham, 'though it be a native in China, is very commonly found in the woods of Sumatra, where it is called coo-ow. It is found extremely difficult to be kept alive for any considerable time after catching it in the woods; never for more than a month. It seems to have an antipathy to the light, being quite inanimate in the open day; but, when kept in a dark place, it appears perfectly at ease, and sometimes makes its note or call, from which it takes its name; and which is rather plaintive, and not harsh like that of a peacock. The flesh resembles that of the common pheasant.'

2. P. colchicus, red, with a blue head, a wedge-shaped tail, and papillous cheeks. It is a native of Africa and Asia.

3. P. gallus, the common dunghill cock and hen, with a compressed caruncle or fleshy comb on the top of the head, and a couple of caruncles or wattles under the chin. The ears are naked, and the tail is compressed and erected. Of all birds perhaps this species affords the greatest number of varieties; there being scarcely two to be found that exactly resemble each other in plumage and form. The tail, which makes such a beautiful figure in most of these birds, is entirely wanting in others; and in some even the rump also. The toes, which are usually four in all animals of the poultry kind, yet in one species amount to five. The feathers, which lie so sleek and in such beautiful order in most of those we are acquainted with, are in a peculiar species all inverted, and stand staring the wrong way. Nay, there is a variety that comes from Japan, which, instead of feathers, seems to be covered over with hair. It is not well ascertained when the cock was first made domestic in Europe; but it is generally agreed that he was first brought to Europe from Persia. Aristophanes calls the cock the Persian bird; and tells us he enjoyed that kingdom before some of its earliest monarchs. This animal was known so early even in the most savage parts of Europe that the cock was one of the forbidden foods among the ancient Britons. Indeed the domestic fowl seems to have banished the wild one. Persia itself seems no longer to know it in its natural form. But the cock is still found in the islands of Tinian, in many others of the Indian Ocean, and in the woods on the coast of Malabar, in its ancient state of independence. In his wild condition his plumage is black and yellow, and his comb and wattles yellow and purple. There is another peculiarity also in those of the Indian woods; their bones, which, when boiled, with us are white, in those are as black as ebony. No animal has greater courage than the cock when opposed to one of his own species; and in every part of the world

where refinement and polished manners have not entirely taken place, cock-fighting is a principal diversion. In China, India, the Philippine Islands, and all over the east, cock-fighting is the sport and amusement even of kings and princes. With us it is declining every day; and it is to be hoped it will in time be abolished even among the vulgar. The cock claps his wings before he sings or crows. His sight is very piercing; and he never fails to cry in a peculiar manner when he discovers any bird of prey in the air. His extraordinary courage is thought to proceed from his being the most salacious of all birds. A single cock suffices for ten or a dozen hens; and it is said that he is the only animal whose spirits are not abated by indulgence. But he soon grows old; the radical moisture is exhausted; and in three or four years he becomes utterly unfit for impregnation. 'Hens also,' says Willoughby, 'as they for the greatest part of the year daily lay eggs, cannot suffice for so many births, but for the most part after three years become barren.' The hen seldom clutches a brood of chickens above once a season, though instances have been known in which they have produced two. The number of eggs a domestic hen will lay in the year are above 200, provided she be well fed and supplied with water and liberty. It matters not much whether she be trodden by the cock or not; she will continue to lay, although the eggs of this kind can never by hatching be brought to produce a living animal. Her nest is made without any care, if left to herself; a hole scratched in the ground, among a few bushes, is the only preparation she makes for this season of patient expectation. Nature, almost exhausted by its own fecundity, seems to inform her of the proper time for hatching, which she herself testifies by a clucking note, and by discontinuing to lay. The good housewives, who often get more by their hens' eggs than by their chickens, often artificially protract this clucking season, and sometimes entirely remove it. As soon as a hen begins to cluck, they stint her in her provisions; when, if that fails, they plunge her into cold water; this, for the time, effectually puts back her hatching; but then it often kills the poor bird, who takes cold and dies under the operation. If left entirely to herself, the hen would seldom lay above twenty eggs in the same nest, without attempting to hatch them. In the wild state the hen seldom lays above fifteen eggs. When the hen has hatched her chickens, her affection seems to alter her very nature, and correct her imperfections. No longer voracious or cowardly, she abstains from all food that her young can swallow, and flies boldly at every creature that she thinks is likely to do them mischief. Capons may very easily be taught to clutch chickens. To effect this they pluck the feathers off his breast, and rub the bare skin with nettles; they then put the chickens to him, which presently run under his breast and belly, and probably rubbing his bare skin gently with their heads, allay the stinging pain which the nettles had just produced. This is repeated for two or three nights, till the animal takes an affection to the chickens that have thus given him relief, and continues to give them the protection they seek for. He from that time brings up a brood of chickens like a hen, clutching them, feeding them, clucking and performing all the functions of the tenderest parent. A capon once accustomed to this service will not give over; but when one brood is grown up, he may have another nearly hatched put under him, which he will treat with the same tenderness he did the former. The cock, from his salaciousness, is a short lived animal in a domestic state; but how long these birds live, if left to themselves, is not yet well ascertained. Aldrovandus hints their age to be ten years; and it is probable that this may be its extent. They are subject to some disorders; and as for poisons, besides nux vomica, which is fatal to most animals except man, they are injured, as Linnæus asserts, by elder-berries, of which they are not a little fond. Of this species Mr. Latham enumerates no less than thirteen varieties, beginning with the wild cock, which is a third less in the body than the domestic cock. This variety he imagines to be the original stock whence all our domestic varieties have sprung. They appear to be natives of the forests of India. There are but few places, however, as he observes, where the different voyagers have not met with cocks and hens either wild or tame. Those of Pulo Condore are very much like our own, but considerably less, being only of the size of a crow. Damp. Voy. vol. I. p. 392. Those of Sumatra and Java are remarkably large, and are called the St. Jago breed. The cock is so tall as to peck off a common dining-table. When fatigued, he sits down on the first joint of the leg. Hist. Sumatra, p. 98. They are found in New Guinea, but not in great plenty. For. Voy. p. 105. Forster observes that they are numerous at Easter, Society, and Friendly Isles; at the two last they are of a prodigious size. They are not uncommon at the Marquesas, Hebrides, and New Caledonia; but the Low Isles are quite destitute of them. See Obs. p. 193. Ducks and poultry are numerous in the Sandwich Isles. Cook's Journal, p. 229. They are not found to breed in the northern parts of Siberia, and in Greenland are only kept as rarities. Faun. Groen.

4. P. Guineensis, the motmot, or Guinea pheasant, is brownish, somewhat red below, with a wedge-like tail, and wants spurs.

5. P. necthemerus is white, with a black crest and belly, and a wedge-shaped tail. It is a native of China.

6. P. pictus has a yellowish crest, a red breast, and a wedge-shaped tail. It is a native of China.

PHA'SIS, *n. s.* In the plural phases. Fr. *phase*; Gr. φασις. Appearance; particular appearance of a heavenly body, as the moon, &c.

All the hypotheses yet contrived, were built upon too narrow an inspection of the *phases* of the universe. *Glanville.*

He o'er the seas shall love, or fame pursue;
And other months, another *phasis* view;
Fixt to the rudder, he shall boldly steer,
And pass those rocks which Tiphys used to fear.
Creech.

Such alas!
Are the illusions of this Proteus life;

All, all is false: through every *phasis* still
'Tis shadowy and deceitful. *Kirk White.*

PHASIS, in ancient geography, a river which falls into the Euxine, about 700 miles from Constantinople. 'From the Iberian Caucasus,' says Gibbon, 'the most lofty and craggy mountains of Asia, that river descends with such oblique vehemence that in a short space it is traversed by 120 bridges. Nor does the stream become placid and navigable till it reaches the town of Sarapana, five days' journey from the Cyrus, which flows from the same hills, but in a contrary direction, to the Caspian Lake. The proximity of these rivers has suggested the practice, or at least the idea, of wafting the precious merchandise of India down the Oxus, over the Caspian, up the Cyrus, and with the current of the Phasis into the Euxine and Mediterranean Sea. As it successively collects the streams of the plain of Colchos, the Phasis moves with diminished speed, though accumulated weight. At the mouth it is sixty fathoms deep, and half a league broad; but a small woody island is interposed in the midst of the channel: the water, so soon as it has deposited an earthy or metallic sediment, floats on the surface of the waves, and is no longer susceptible of corruption. In a course of 100 miles, forty of which are navigable for large vessels, the Phasis divides the celebrated region of Colchos, or Mingrelia, which, on three sides, is fortified by the Iberian and Armenian mountains, and whose maritime coast extends about 200 miles, from the neighbourhood of Trebizond to Dioicurias, and the confines of Circassia. Both the soil and climate are relaxed by excessive moisture; twenty-eight rivers, besides the Phasis and his dependent streams, convey their waters to the sea; and the hollowness of the ground appears to indicate the subterraneous channels between the Euxine and the Caspian.'

PHASIS, an ancient city of Colchis, so named from the above river.

PHASM, *n. s.* Gr. φασμα. Appearance; phantom; fancied apparition.

Thence proceed many aereal fictions and *phasms* and chymæras created by the vanity of our own hearts or seductions of evil spirits, and not planted in them by God. *Hammond.*

PHASMATA, PHASMS, in physiology, are certain appearances arising from the various tinctures of the clouds by the rays of the heavenly bodies, especially the sun and moon. These are infinitely diversified by the different figures and situations of the clouds, and the appulses of the rays of light; and, together with the occasional flashings and shootings of different meteors, they have, no doubt, occasioned those prodigies of armies fighting in the air, &c., of which we have such frequent accounts in most ancient authors. See 2 Maccab. xi. 8; Melancth. Meteor; 2 Shel. de Comet. ann. 1618; Josephus.

PHASSACHATES, in lithology, a species of agate, which the ancients, in its various appearances, sometimes called leucachates and perileucos.

PHAUSINGES, in medicine, Gr. φαύσιγγες, red circles in the leg, produced by the heat of the fire.

PHAVORINUS, an ancient lexicographer, author of a Greek Lexicon, still extant; the best edition of which is that in fol. Venet. 1712. Lempriere. Perhaps he is the same with Favorinus, a native of Arles in Gaul. See FAVORINUS.

PHAYLLUS, tyrant of Ambracia, brother of the celebrated Onomarchus of Phocis. See PHOCIS. *Paus.* x. c. 2.

PHEA, or PHEIA, an ancient town of Elis. *Homer's Iliad*, vii.

PHEAS'ANT, *n. s.* Fr. *faisan*; Lat. *phasianus*, from Phasis a river of Colchis. A kind of wild cock.

The hardest to draw are tame birds; as the cock, peacock, and *pheasant*. *Peacham on Drawing.*

Preach as I please, I doubt our curious men
Will chuse a *pheasant* still before a hen. *Pope.*

Not so the *pheasant* on his charms presumes,
Though he too has a glory in his plumes.
He, christian-like, retreats with modest mien
To the close copse, or far sequestered green,
And shines without desiring to be seen. *Cowper.*

PHEASANT, in ornithology. See PHASIANUS. Mr. Latham enumerates nine different species of pheasant, and six varieties of the common; but as he gives them no distinctive, trivial, or classical names, we reserved a description of several of them to this article.

1. PHEASANT, COMMON. Latham observes that the common pheasant is now found in a state of nature in almost the whole of the old continent. They sometimes, he says, come into farm-yards near woods, and produce cross breeds with common hens. 'M. Salerne,' he adds, 'remarks that the hen pheasant, when done laying and sitting, will get the plumage of the male, and after that become so little respected by him as to be treated with the same incivility as he would show to one of his own sex. Pheasants were originally brought into Europe from the banks of the Phasis, a river of Colchis, in Asia Minor; and from whence they still retain their name. Next to the peacock, they are the most beautiful of birds, as well for the vivid colors of their plumes as for their happy mixtures and variety. These birds, so beautiful to the eye, are not less delicate when served up to the table. Their flesh is considered as the greatest dainty. A spirit of independence seems to attend the pheasant even in captivity. In the woods, the hen pheasant lays from eighteen to twenty eggs in a season; but, in a domestic state, she seldom lays above ten. In the same manner, when wild, she hatches and leads up her brood with patience, vigilance, and courage; but when kept tame, she never sits well, so that a hen is generally her substitute upon such occasions: and, as for leading her young to their food, she is utterly ignorant of where it is to be found; and the young birds starve, if left solely to her protection. The pheasant, therefore, on every account, seems better left at large in the woods than reclaimed to pristine captivity. Its fecundity when wild is sufficient to stock the forest; its beautiful plumage adorns it; and its flesh retains a higher flavor from its unlimited freedom. At night they roost upon the highest trees of the wood; and by day they come down into the lower brakes and bushes, where their food is chiefly found. They

generally make a kind of flapping noise when they are with the females; and this often apprises the sportsman of their retreats. At other times he traces them in the snow, and frequently takes them in springs. But of all birds they are shot most easily; as they always make a whirring noise when they rise, by which they alarm the gunner, and being a large mark, and flying very slow, there is little chance of missing them. When these birds are taken young into keeping, they become as familiar as chickens. For her nest dry grass and leaves must be laid for her in the pheasantry. The young ones are very difficult to be reared, and they must be supplied with ants' eggs, which is the food the old one leads them to gather when wild in the woods. To make these go the farther, they are to be chopped up with curds or other meat: and the young ones are to be fed with great exactness, both as to the quantity and the time of their supply. This food is sometimes also to be varied; and wood-lice, earwigs, and other insects, are to make a variety. The place where they are reared must be kept extremely clean; their water must be changed twice or thrice a day; they must not be exposed till the dew is off the ground in the morning, and they should always be taken in before sunset. When they become adult, they can very well shift for themselves; but they are particularly fond of oats and barley. The pheasant, when full grown, seems to feed indifferently upon every thing that offers. A French writer asserts that they regale even upon carrion.

2. Pheasant, Courier. The courier pheasant is but very imperfectly described by Fernandez; and is said to be eighteen inches long. The general color of the plumage is white, inclined to fulvous; about the tail they are black, mixed with some spots of white; the tail itself is long, and of a green color, reflecting in some lights like the feathers of a peacock: the wings are short. This species inhabits the hotter parts of Mexico; flies slow; but is recorded to outrun the swiftest horse.

3. Pheasant, Hybridal, a name given by Latham to a species or variety which is a mixed breed between the pheasant and cock; one of which was in the Leverian Museum.

4. Pheasant, Parraka. The parraka is about the size of a small fowl, resembling it in the bill, legs, and body. Its length is twenty-three inches. The color of the bill is dark rufous; the eyes are brown; the general color of the plumage is a deep brown on the back, and fulvous under the belly: the top of the head is fulvous, and the feathers are somewhat long, but not so much as to form a real crest; the wings are short; the webs of some of the quills are somewhat rufous; the tail consists of twelve feathers, is even at the end, about a foot in length, and is, for the most part, carried pendent; the legs are of a dark rufous, inclining to black; the claws are like those of a fowl. It is peculiar (says Mr. Latham) in its internal structure in respect to the windpipe; which, instead of entering directly the breast, as in most birds, passes over the side of the left clavicle, and on the outside of the fleshy part of the breast, being covered only by the skin; then, taking a turn upwards, passes over the right clavicle into the breast, and is distributed through the lungs in the usual way. The female has not this circumvolution of the windpipe. The hannequaw, mentioned by Bancroft, is probably the same bird. He says that it is black, roosts in trees, and may be heard early in the morning, distinctly but hoarsely, repeating the word hannequaw (easily mistaken for parraquaw) very loud. These are found in the unfrequented woods of the internal parts of Cayenne, Guiana, and many parts of South America. At sun-rise they set up a very loud cry, which is thought to be the loudest of all birds in the New World; at which time the eyes appear red, as does a small skin under the breast, which is not at all seen, except when the bird makes such exertions, or is angry. This cry is very like the word parraquaw; and is repeated many times together; and often many cry at once, or answer one another, but most in breeding time, which is twice in the year; at each time laying from four to six eggs; making the nest in low branches or stumps of trees, and behaving with their chickens in the same manner as hens. They feed on grain, seeds, and herbs; but feed the young in the nest with worms and small insects. These, with many other birds, inhabit the woods by day, coming out into the open savannas morning and evening to feed; at which times they are chiefly killed by the natives and near inhabitants. They may be brought up tame; and their flesh is much esteemed.

5. Pheasant, Superb. This bird Linnæus describes from the various representations of it painted on paper hangings, and China-ware; and farther confirmed by a figure and description in a Chinese book which came under his inspection.

In stocking a pheasantry, says Mr. Loudon, the general mode is to procure eggs from some establishment of this sort or otherwise. The following are the directions of Castang, as given in Mowbray's Treatise on Poultry:—Eggs being provided, put them under a hen that has kept the nest three or four days; and, if you set two or three hens on the same day, you will have the advantage of shifting the good eggs. At the end of ten or twelve days throw away those that are bad, and set the same hen or hens again, if sitting hens should not be plenty. The hens having sat their full time, such of the young pheasants as are already hatched put into a basket, with a piece of flannel, till the hen has done hatching. The brood now come, put under a frame with a net over it, and a place for the hen, that she cannot get to the young pheasants, but that they may go to her: and feed them with boiled egg cut small, boiled milk and bread, alum curd, ants' eggs, a little of each sort and often. After two or three days they will be acquainted with the call of the hen that hatched them, may have their liberty to run on the grass plat, or elsewhere, observing to shift them with the sun, and out of the cold winds; they need not have their liberty in the morning till the sun is up; and they must be shut in with the hen in good time in the evening. Every thing now going on properly, you must be very careful (in order to guard against the distemper to which they are liable) in your choice of a situation for breeding the birds up; and be less afraid of foxes, dogs, polecats, and all sorts of vermin, than the distemper. Castang had rather encounter all the former than the latter; for those with care may be prevented, but the distemper once got in is like the plague, and destroys all your hopes. What he means by a good situation is nothing more than a place where no poultry, pheasants, or turkeys, &c., have ever been kept; such as the warm side of a field, orchard, pleasure-ground, or garden, or even on a common, or a good green lane, under circumstances of this kind; or by a wood side; but then it is proper for a man to keep with them, under a temporary hovel, and to have two or three dogs chained at a proper distance, with a lamp or two at night. He has known a great number of pheasants bred up in this manner in the most exposed situations. It is proper for the man always to have a gun, that he may keep off the hawks, owls, jays, magpies, &c. The dogs and lamps shy the foxes more than any thing; and the dogs will give tongue for the man to be on his guard if smaller vermin are near, or when strollers make their appearance. The birds going on as before mentioned, should so continue till September, or (if very early bred) the middle of August. Before they begin to shift the long feathers in the tail, they are to be shut up in the basket with the hen regularly every night; and when they begin to shift their tail the birds are large, and begin to lie out, that is, they are not willing to come to be shut up in the basket: those that are intended to be turned out wild, should be taught to perch (a situation they have never been used to); this is done by tying a string to the hen's leg, and obliging her to sit in a tree all night: be sure you put her in the tree before sun-set; and, if she falls down, you must persevere in putting her up again till she is contented with her situation; then the young birds will follow the hen, and perch with her. This being done, and the country now covered with corn, fruits, and shrubs, &c., they will shift for themselves. For such young pheasants as you make choice of for your breeding-stock at home, and likewise to turn out in the spring following, provide a new piece of ground, large and roomy for two pens, where no pheasants, &c., have been kept, and there put your young birds in as they begin to shift their tails. Such of them as you intend to turn out at a future time, or in another place, put into one pen netted over, and leave their wings as they are; and those you wish to keep for breeding put into the other pen, cutting one wing of each bird. The gold and silver pheasants you must pen earlier, or they will be off. Cut the wing often; and when first penned feed all your young birds with barley-meal, dough, corn, and plenty of green turnips.

Strict cleanliness is to be observed in *feeding* pheasants: the meat must not be tainted with dung, and the water to be pure and often renewed. Ants' eggs being scarce, hog-lice, earwigs, or any insect may be given; or artificial ants' eggs substituted, composed of flour beaten up with an egg and shell together, the paste rubbed between the fingers to the proper size. After the first three weeks, in a scarcity of ants' eggs, Castang gives a few gentles, procured from a good liver tied up, the gentles, when ripe, dropping into a pan or box of bran; to be given sparingly, and not considered as common food. Food for grown pheasants, barley or wheat; generally the same as for other poultry. In the spring hemp seed, or other warming seeds, is comfortable, and will forward the breeding stock.

Pheasant-pouts. Young pheasants; for the driving and taking of which within nets, when you have found out an eye of them, place your nets cross the little paths and ways they have made, which are much like sheep tracks; and if possible, you should find out one of their principal haunts, which may be easily known by the barrenness of the ground, their mutings, and the feathers which lie scattered about; and always take the wind with you, for it is their custom to run down the wind; place the nets hollow, loose and circular-wise; the nether-part must be fastened to the ground, and the upper side is hollow, so that when any thing rushes in, it may fall and entangle it. Having so fixed the nets, go to the haunts, and if you find the eye scattered, with your call draw them together, and when you find them begin to cluck and pipe to one another, then forbear calling, and take an instrument, by some called a driver; which is made of strong white wands, or osiers, such as basket-makers use, which must be set in a handle: in two or three places it must be twisted or bound about with small osiers, according to the figure. With this driver, as soon as you see the pheasants gathered together, make a great noise on the boughs and bushes about you, which will so frighten them that they will all get close together, and run away a little distance, and stand to hearken. then make the same noise a second time, which will make them run again, and continue the same till you have driven them into your nets, for they may be driven like sheep; but, if it happens that they take a contrary way, then make a croaking noise, as it were, in their faces, which will presently turn them the right way, as you would have them; but, in using the driver, first observe secrecy, in keeping yourself out of their sight; for if they espy you they will run and hide themselves in holes, under shrubs, and will not stir till night. Secondly, take time and leisure, for rashness and over-haste spoil the sport.

Pheasant-shooting. This is now the only method (as hawking is disused) by which pheasants are taken by the fair sportsman. See the article Shooting.

Pheasant's Eye, in botany. See Adonis.

Pheasants, Isle of, or Isle de Faisans, or the Isle of Conference, an island between France and Spain, formed by the Bidassoa, abounding with pheasants. The Bidassoa has long been a subject of dispute between France and Spain, each country laying claim to it exclusively; until the fifteenth century, when it was agreed between Louis XII. of France, and Ferdinand V. of Spain, that the river should be common to both nations. This island was afterwards the scene where another treaty, called the Treaty of the Pyrenees, was concluded between France and Spain, in 1699; and it was also the scene of an interview between the monarchs of these kingdoms, on the marriage of Louis XIV. whence its latter name. It lies about two miles from Fontarabia.

PHEBE, a deaconess of the port of Corinth, called Cenchrea. St. Paul had a particular esteem for her; and Theodoret thinks he lodged at her house while he continued at Corinth. She brought to Rome the epistle he wrote to the Romans, wherein she is commended in so advantageous a manner. See Rom. xvi. 1, 2.

PHEESE, *v. a.* Perhaps to feaze. To comb; fleece; curry. Obsolete.

An he be proud with me, I'll *pheese* his pride.
Shakspeare.

PHECADUM, an ancient inland town of Macedonia.

PHEGOR, or PEOR, a deity worshipped at a very early period by the Midianites and Moabites, and probably by all the other tribes which then inhabited Syria. Phegor, or Peor, is the same with the Hebrew word pechor, which signifies aperuit, and probably refers to the poetic influence always attributed to the solar deity, by which he opened or discovered things to come. Accordingly we find Phegor or Peor generally joined to Baal, which was the Syrian and Chaldean name of the sun after he became an object of worship; hence Baal-Phegor must have been the sun worshipped by some particular rites, or under some particular character. See BAAL PEOR.

PHELLANDRIUM, water hemlock; a genus of the digynia order and pentandria class of plants: natural order forty-fifth, umbellatæ. There are two species, one of which, viz.

P. aquaticum, is a native of Britain. This grows in ditches and ponds, but is not very common. The stalk is remarkably thick and dichotomous, and grows in the water. It is a poison to horses, bringing upon them, as Linnæus informs us, a kind of palsy; which, however, he supposes to be owing not so much to the noxious qualities of the plant itself, as to those of an insect which feeds upon it, breeding within the stalks, and which he calls curculio paraplecticus. The Swedes give swines' dung for the cure. The seeds are sometimes given in intermittent fevers, and the leaves are by some added to discutient cataplasms. In the winter the roots and stem, dissected by the influence of the weather, afford a very curious skeleton or network. Horses, sheep, and goats, eat the plant; swine are not fond of it; cows refuse it.

PHELLIA, a river of Laconia.

PHELLOE, an ancient town of Achaia.

PHELLUS, two ancient towns of Greece: one in Attica; and the other in Elis, near Olympia.

PHEMIUS, an ancient musician, who taught Homer music.

PHEMONOE, a priestess of Apollo, who is said to have been the inventress of heroic verses.

PHENEATÆ, the people of Pheneum.

PHENEUM, an ancient town of Arcadia, where Mercury had a temple.

PHENEUS, a town and lake of Arcadia.

PHENGITES, among the ancients, the name of a beautiful species of alabaster. It was a rude irregular mass, very shattery and friable, but of a brightness superior to that of most other marbles, and excelling them all in transparence. The color an agreeable pale yellowish, white, or honey color; the yellow being more intense in some places than others, and sometimes making an obscure resemblance of veins. It is still found, and is very weak and brittle in the mass; when reduced to small pieces, it may be easily crumbled between the fingers into loose, but considerably large, angular pieces, some perfect, others complex, irregular, or mutilated, and all approaching to a flat shape. The ancients were very fond of this species in public buildings; and the temple of Fortune, built entirely of it, has been long celebrated. Nero's golden house was constructed mainly of this marble: and Domitian is said to have had a portico built wholly of it, in which he promenaded enclosed. Its great beauty is its transparence, from which alone the above temple was perfectly light when the doors were shut, though it was built without a window, and had no other light but what was transmitted through the stone its walls were built with. It was anciently found in Cappadocia, and is still plentiful there: we have it also in Germany and France, and in Derbyshire and some other English counties. It takes an excellent polish, and is very fit for ornamental works, where there is no great strength required. See AMETHYST.

PHENICE, a port of the island of Crete, on the west coast of the island. St. Paul having anchored at Phenice, in his voyage to Rome (Acts xxvii. 12), advised the ship's crew to spend the winter there, because the season was too far advanced.

PHENICIA. See PHŒNICIA.

PHENICOP'TER, *n. s.* Gr. φοινικοπτερος; Lat. *phænicopterus.* A kind of bird described by Martial.

He blended together the livers of giltheads, the brains of pheasants and peacocks, tongues of *phenicopters*, and the melts of lampreys. *Hakewill.*

PHE'NIX, *n. s.* Gr. φοινιξ; Lat. *phœnix.* A bird supposed to exist single, and to rise again from its own ashes.

There is one tree, the *phenix* throne; one *phenix*
At this hour reigning there. *Shakspeare. Tempest.*

To all the fowls he seems a *phenix*. *Milton.*

Having the idea of a *phenix* in my mind, the first enquiry is, whether such a thing does exist. *Locke.*

PHENOM'ENON, *n. s.* French *phenomene*; Gr. φαινομενον, often written phænomenon. It has the original plural termination phænomena: appearance; visible quality: remarkable appearance.

Short-sighted minds are unfit to make philosophers, whose business it is to describe, in comprehensive theories, the *phenomena* of the world and their causes. *Burnet.*

These are curiosities of little or no moment to the understanding the *phænomena* of nature.
Newton.

The most considerable *phenomenon*, belonging to

terrestrial bodies, is gravitation, whereby all bodies in the vicinity of the earth press towards its centre.
Bentley's Sermons.

PHEONS, in heraldry, the barbed heads of darts, arrows, or other weapons, frequently borne in court armours, and termed a Pheon's Head, in Latin Ferrum Jaculi, in French Fer de Dard; as 'He beareth azure, a chevron between three pheons.'

PHEOS, in botany, a name which Theophrastus, Dioscorides, and others, give to a plant used by fullers in dressing their cloths, and of which there were two kinds, a smaller called simply pheos, and a larger called hippopheos. This plant is sometimes called phleos; and is thus confounded with a kind of marsh cudweed, or gnaphalium, called also by that name; but it may always be discovered which of the two plants an author means, by observing the sense in which the word is used, and the use to which the plant was put. The phleos, properly so called, that is, the cudweed, was used to stuff beds and other such things, and to pack up with earthen vessels to prevent their breaking; but the pheos, improperly called phleos, only about cloths: this was, however, also called stæbe and cnaphon.

PHERÆ, an ancient town of Thessaly, where the tyrant Alexander reigned, hence named Pheræus. Strabo 8. Cic. de Off. 2.

PHERÆUS, a surname of Jason and Alexander.

PHERECRATES, a Greek comic poet, who was contemporary with Plato and Aristophanes. After the example of the ancient comedians, who never introduced upon the theatre imaginary but living characters, he acted his contemporaries. But he did not abuse the liberty which at that time prevailed upon the stage. He laid it down as a rule to himself never to hurt the reputation of any person. Twenty-one comedies are attributed to him, of which there now only remain some fragments collected by Hertelius and Grotius. From these, however, it is easy to discern that Pherecrates wrote the purest Greek, and possessed that ingenious and delicate raillery which is called attic urbanity. He was author of a work on Music, and a kind of verse called Pherecratic.

PHERECRATIC VERSE. The last three feet were in hexameter verse, and the first of those three feet was always a spondee. This verse of Horace, for example, Quamvis pontica pinus, is a Pherecratic verse.

PHERECYDES, a native of Scyros, who flourished about A. A. C. 560, and was disciple of Pittacus. See PITTACUS. He is said to have been the first philosopher who wrote on natural subjects and the essence of the gods. He was also the first who held the ridiculous opinion, 'that animals were mere machines.' He was Pythagoras's master, who loved him as his own father: he lived to the age of eighty-five, and was one of the first prose writers among the Greeks. It is difficult to give an accurate account of the doctrines of Pherecydes. It is most probable that he taught those opinions concerning the gods and the origin of the w which the ancient Grecian theogonists rowed from Egypt. See EGYPT, MYTH MYTHOLOGY, and POLYTHEISM.

PHERES, in fabulous history, the so Cretheus and Tyro, who built Pheræ, in T saly, where he reigned. He married Cly by whom he had Admetus. Apollod.

PHERETIMA, the wife of Battus, ki Cyrene, and the mother of Arcesilaus. her son's death she recovered the kingdo the aid of Amasis king of Egypt, and, to a the murder of Arcesilaus, she caused all hi sassins to be crucified round the walls of Cy and she cut off the breasts of their wives, hung them up near the bodies of their husb It is said that she was devoured alive by w a punishment from heaven for her unpara cruelties.

PHERON, a king of Egypt, who succ Sesostris. He was blind; and recovere sight by washing his eyes, according to th rections of the oracle, in the urine of a w who had never had any unlawful conne He tried his wife first, but she appeared to been faithless to his bed, and was burnt wi those whose virtue would not abide the tes scribed: he married the woman who thus him. Herodot. ii. c. 111.

PHETRI. See PARTHIA.

PHIAL, *n. s.* Gr. φιαλη; Fr. *phiole*; *phiala*. A small bottle.

Upon my secure hour thy uncle stole
With juice of cursed hebenon in a *phial*. *Shak*

He proves his explications by experiments with a *phial* of water, and with globes of glas with water. *Ne*

Nor less inspire my conduct than my song;
Teach my best reason reason; my best will
Teach rectitude; and fix my firm resolve
Wisdom to wed, and pay her long arrear:
Nor let the *phial* of thy vengeance, poured
On this devoted head, be poured in vain. *Yo*

PHIALIA, a town of Arcadia. Paus.

PHICORES, an ancient nation who inha the banks of the Palus Mæotis. Mela i. 1

PHIDIAS, the most famous sculptor of quity, was an Athenian, and flourished i eighty-third Olympiad. This wonderful was not only skilled in the use of his tool accomplished, we are told, in history, p fable, geometry, optics, &c. He first taug Greeks to imitate nature perfectly, and works were received with admiration. were also incredibly numerous; for it w most peculiar to Phidias that he unite greatest facility with the greatest perfectio Nemesis, one of his first pieces, was carve of a block of marble, found in the P camp, after the battle of Marathon. He an excellent statue of Minerva for the Pla but the statue of this goddess in her magn temple at Athens, of which there are still relics, was an astonishing production. Pe ordered Phidias to make a statue of the god and Phidias formed a most admirable fig ivory and gold, thirty-nine feet high. Bu rendered his name immortal proved at th his ruin. He had carved upon the shield goddess his own portrait and that of Per and this was made a crime. Upon this he withdrew to Elis, and made for the Elians the Olympic Jupiter; a prodigy of art which was ranked among the seven wonders of the world. It was of ivory and gold; sixty feet high, and every way proportioned. Phidias concluded his labors with this masterpiece; and the Elians, to do honor to his memory, appropriated to his descendants the office of keeping clean this magnificent image. The remains of the statue of the Eleusinian Ceres were purchased by the late Dr. E. D. Clarke and Mr. Cripps of Jesus College, Cambridge, and after being removed at considerable labor and expense, from Greece to England, are now now fixed in the public library of that university.

PHIDIPPIDES, a celebrated courier, who ran from Athens to Lacedæmon, about 152 English miles in two days, to ask of the Lacedæmonians assistance against the Persians. The Athenians raised a temple to his memory.

PHIDITIA, in Grecian antiquity, feasts celebrated with great frugality at Sparta. They were held in the public places and in the open air. Rich and poor assisted at them equally, and on the same footing; their design being to keep up peace, friendship, good understanding, and equality among the citizens great and small. It is said that those who attended this feast brought each a bushel of flour, eight measures of wine named chorus, five mince of cheese, and as many figs.

PHIGALEI, an ancient people of Peloponnesus, who inhabited the country near Messenia. Paus.

PHILA, from φιλειν, to love, in mythology, one of the attributes of Venus, which distinguishes her as the mother of love.

PHILA, an ancient town of Macedonia.

PHILADELPHIA, in antiquity, were games instituted at Sardis to celebrate the union of Caracalla and Geta, the sons of Septimius Severus.

PHILADELPHIA, in ancient geography, the name of four towns; 1. In Arabia. 2. In Cicilia. 3. In Syria. (Lempr.) 4. In Lydia, now called Alah-sher. Plin. v. c. 29.

PHILADELPHIA, an ancient town of Natolia, seated at the foot of mount Tmolus, by the river Cogamus, whence there is a fine view over an extensive plain. It was founded by Attalus Philadelphus, brother of Eumenes, and very liable to earthquakes, which, perhaps, arose from its vicinity to the region called Catakekanmene. So severe were those earthquakes that even the city walls were not secure; and so frequent were they that these experienced daily concussions. The inhabitants, therefore, who were not numerous, lived in perpetual apprehension, and their constant employment was in repairs. In fact, so great were their fears, that their chief residence was in the country, the soil of which was very fertile. Such is Strabo's account of this place. In 1097 it was taken by assault by John Ducas the Greek general. It was without difficulty reduced also in 1106, under the same emperor. The Turks marched from the east with a design to plunder it and the maritime towns. The emperor Manuel in 1175 retired for protection from the Turks to this place. In 1300 it fell by lot to Karaman. In 1306 it was besieged by Alisaras, and considerably harassed; but was not taken. In 1391 this place alone refused to admit Bajazet; but it was at length forced to capitulate for want of provisions. It has been matter of surprise that this town was not totally abandoned; and yet it has survived many cities less liable to inconveniencies, and is still an extensive place, though in appearance it is poor and mean. The materials of the walls appear to have been small stones strongly cemented: they were thick, lofty, and had round towers. Among the mountains near, is a spring of a purgative quality; and many people resort to it in the hot months. The famous wall which credulity has believed to be made of human bones, stands beyond this and the town. Dr. Chandler, who visited it, says, 'the number of churches is twenty-four, mostly in ruins, decorated with painted saints. Only six are in a better condition. The episcopal church is large, and ornamented with gilding, carving, and holy portraits. The Greeks are about 300 families, and live in a friendly intercourse with the Turks. The clergy and laity in general are ignorant of Greek, yet the liturgies and offices of the church are read in that language. The Philadelphians are a civil people. One of the Greeks sent us a small earthen vessel full of choice wine. Philadelphia possessing waters excellent in dyeing, and being situated on one of the most capital roads to Smyrna, is much frequented, especially by Armenian merchants. The Greeks still call this place by its ancient name, but the Turks call it Allahijur. The number of inhabitants is about 8000; of whom 2000 are supposed to be Christians.' It is about forty miles E. S. E. of Smyrna.

PHILADELPHIA, a county of Pennsylvania, bounded north by Bucks County, south-east by Delaware River, south-west by Delaware county, west and north-west by Montgomery county.

PHILADELPHIA, a city and port of entry, Pennsylvania, in a county of the same name, on the west bank of the Delaware; ninety miles south-west of New York, 100 north-east of Baltimore, 321 south-west of Boston, 137 of Washington. Long. 75° 10′ W., lat. 39° 57′ N. Population of the city and liberties, in 1790, 43,525; in 1802 62,000; in 1810 92,247; and in 1817 estimated at 120,000. In 1810 there were, within the city and suburbs, 22,764 buildings, of all kinds, for residence, business, worship, &c.

It is 126 miles from the Atlantic, by the course of the river and bay, and is situated on the narrowest part of an isthmus between the Delaware and the Schuylkill rivers, about six miles above their confluence. The situation is very pleasant and healthy. It was originally laid out by William Penn, in 1683.—The ground plot of the city, distinct from the liberties, is an oblong, about one mile from north to south, and two from east to west. But the buildings now occupy a space upwards of three miles long, from north to south, and they extend from the Delaware to the Schuylkill. There were originally nine streets extending from one river to the other, which were intersected at right angles by twenty-three running north and south. The number of squares in the original plan was 184, but, as several of these have been intersected by new streets, their number now amounts to 304; and several of these are again intersected by lanes and alleys. Broad Street is 113 feet wide; High or Market Street 100; Mulberry Street sixty; and the other streets, in the original plan, fifty feet wide. The greatest part of the city is well paved with stones in the middle, with neat side walks of brick; furnished with common sewers and gutters, so that the streets are in general kept very clean.

The public buildings are the late state house and offices, two city court houses, a county house, a state penitentiary, a bridewell or jail, a university, the Philosophical Society's hall, the hall for the Academy of Natural Sciences, the Washington Hall, a public library, a hospital, the Friends' alms-house, three dispensaries, an alms-house, two dramatic theatres, a medical theatre, a laboratory, an amphitheatre, a masonic hall, ten incorporated banks, and fifty-nine houses of public worship, nine for General Assembly Presbyterians, two for Associate Reformed Presbyterians, two for Dutch Reformed Presbyterians, two for Reformed Presbyterians, one for Associate Presbyterians, one for German Presbyterians, eleven for Methodists, six for Episcopalians, six for Friends, five for Baptists, four for Roman Catholics, two for German Lutherans, one for English Lutherans, one for Swedes, one for Moravians, one for Universalists, one for Unitarians, one for Dunkers, a New Jerusalem church, and a Jews' Synagogue.

Several of the churches are very spacious and elegant edifices. Each of the Episcopal, the German, and two of the Roman Catholic churches are furnished with organs; and one of the Episcopal churches is ornamented with a steeple. The state house was erected in 1753, and its architecture is much admired. It is now appropriated as a museum, and contains the largest collection of curiosities in America. Adjoining to it is an enclosed square, which is ornamented with rows of trees, and forms a pleasant public walk. The bank of Pennsylvania is a remarkably elegant edifice of marble. The masonic hall is an elegant Gothic edifice, with a handsome steeple. The houses of the city are generally constructed of brick, without much ornament, but have a striking appearance of convenience, comfort, neatness, and opulence. The city contains five different markets, the principal of which is in Market, or High Street, and extends from the Delaware through six squares. The market houses are well supplied with various provisions, which are exposed to sale daily, and most abundantly every Wednesday and Saturday. The United States' bank is in this city; and here is the mint of the United States, in which the national money is coined.

Philadelphia exceeds all other towns in the United States in the variety, extent, and excellence of its manufactures. In 1810 the city and county contained eight cotton manufactories, twenty nail manufactories, eighteen distilleries, seventeen breweries, fifty-nine tanneries, seven paper-mills, fifteen rope walks, three glass works, fourteen marble yards, fifty-four printing offices, and numerous other manufacturing establishments. The total amount of the manufactures of the city and county in 1810 was 16,1[illegible] dollars. Printing is carried on here more extensively than in any other place in America. This city is celebrated for its excellent porter brewery.

Philadelphia is a place of great opulence, and its trade is extensive and flourishing. Turnpike roads of the best construction diverge from it in various directions. Over the Delaware, Schuylkill, and Susquehanna, in the approaches to the city, there are ten excellent bridges. The Delaware is navigable to this place for a seventy-four gun ship, and for sloops to Trenton. The shipping belonging to this port in 1816 amounted to 101,830 tons.—The environs of the city are pleasant and well cultivated.

The literary and benevolent institutions are numerous, and highly honorable to the inhabitants. The Philadelphia library originated with Dr. Franklin, and was incorporated in 17[illegible]. The building belonging to the library company is an elegant edifice, and in its front is a statue of Dr. Franklin, of white marble. It contains a museum, a philosophical apparatus, the Philadelphia library, and the Loganian library, which, together, have about 22,000 volumes. The American Philosophical Society was established here in 1769, and has a library of 4000 volumes. The Philadelphia Society for Promoting Agriculture was instituted in 1785, and has a small library, a cabinet of minerals, and a repository for agricultural implements. The Athenæum of Philadelphia was incorporated in 1815, and has a library of 2000 volumes, a cabinet of minerals and medals, and upon its tables are to be found the principal newspapers published in the United States, and a numerous collection of the American and European Magazines. The Academy of Natural Sciences was founded in 1812, and incorporated in 1817, and has a library of 2000 volumes, and handsome collections on natural history. The library of the Society of Friends contains about 2000 volumes. The oldest seminary of learning in Pennsylvania is that incorporated by William Penn, by the title of Friends Public School. This corporation has considerable funds, and supports a number of schools; and under its directions the Latin and Greek Languages, the mathematics, and natural and experimental philosophy, are taught. The astronomical observatory in the city belongs to this institution, and it likewise possesses an extensive philosophical apparatus.

The Pennsylvania Hospital was established in 1752, and is the most respectable institution of the kind in the union. The whole extent of the buildings from east to west is 278 feet, and detached from the hospital is another building of three stories, calculated to accommodate forty or fifty patients. The number of patients is usually from 190 to 220, including ninety lunatics. There are belonging to the hospital a valuable anatomical museum, and a library of about 4500 volumes. In 1817 a handsome building was erected for the accommodation of the celebrated painting of Mr. West, representing Christ healing the sick. This painting is a source of a handsome income to the hospital.

The university of Pennsylvania was erected into a university, upon the foundation of what was denominated the Academy and Charity School, and it is chartered as a complete university. The board of trustees, who are twenty-four in number, have the power of appointing professors in all the branches of science. The establishment consists at present of four departments of arts, medicine, natural science, and law, in each of which lectures are given, and a system of instruction is established. Connected with the university are the academy, in which youth are instructed in the learned languages, preparatory to college, and a charity school for the education of poor children.

A large edifice, built for the accommodation of the president of the United States, is occupied by the university. The building devoted to the faculty of arts has excellent lecture rooms, and a large hall for public exercises. The apparatus belonging to the college is said not to be surpassed by any other of the kind in the country. The library contains 3000 or 4000 volumes. The offices in the department of arts are a provost, who is also a professor of moral philosophy and belles lettres; a vice provost, who is also a professor of mathematics and natural philosophy, and a professor of languages. The number of undergraduates is about forty. The course of education is completed in three years.

Philadelphia Stones, a name which some authors have given to what are otherwise called Christian bones found in the walls of the Natolian city of this name. It is a vulgar error that these walls are built of bones; the tradition of the country being that when the Turks took the place they fortified it for themselves, and built their walls of the bones of the Christians whom they killed there. This idle opinion gained credit merely from a loose and porous stone of the sparry kind being found in an old aqueduct in the wall. Sir Paul Rycaut brought home pieces of these stones, which he supposed to have been bones; but they proved on examination to be various bodies, chiefly vegetable, incrusted over and preserved in a spar of the nature of that which forms incrustations in Knaresborough spring, and other places with us. These bodies are often cemented together in considerable numbers by this matter, and their true shape lost in the congeries.

Philadelphian Society, in ecclesiastical history, an obscure and inconsiderable society of mystics, formed about the end of the seventeenth century by an English female fanatic, whose name was Leadley. This woman induced by her visions, predictions, and doctrine, several persons of learning to become her disciples. She believed that all dissensions among Christians would cease, and the kingdom of the Redeemer become a scene of charity and felicity, if Christians, disregarding the forms of doctrine or discipline of their several communions, would all join in committing their souls to the care of the internal guide, to be instructed, governed, and formed by his divine impulse and suggestions. But she went farther: and pretended a divine commission to proclaim the approach of this glorious communion of saints. One of her leading doctrines was that of the final restoration of all intelligent beings to perfection and happiness.

PHILADELPHUS, in antiquity, from the Greek φιλος, lover, and αδελφος, brother; a title or surname of several ancient kings. See Ptolemy and Egypt.

Philadelphus, in botany, the pipe-tree, or mock orange; a genus of the monogynia order, and icosandria class of plants; natural order nineteenth, hesperideæ.

1. P. coronarius, white syringa, or mock orange, has been long cultivated in the gardens of this country as a flowering shrub: it is not well known in what country it is to be found native. It rises seven or eight feet high, sending up a great number of slender stalks from their root. These have a gray bark, branch out from their sides, and are garnished with oval spear-shaped leaves. These last have deep indentures on their edges; their upper surface being of a deep green, but the under surface pale, with the taste of a fresh cucumber. The flowers are white, and come out from the sides and at the ends of the branches in loose bunches, each standing on a distinct foot-stalk: they have four oval petals, which spread open, with a great number of stamina within, surrounding the style. This shrub, by its flowers, makes a fine figure in May and June; for they are produced in clusters both at the end and from the sides of the branches. They are of a fine white color, and exceedingly fragrant. The petals of which each is composed are large, and spread open like those of the orange; and then forming branches, which stand each on its own separate foot-stalk, and being produced in plenty all over the shrub, feast at once both the eye and the smell. These flowers, however, are very improper for chimneys, water-glasses, &c., in rooms, as their scent will be too strong. The double-flowering syringa is a variety seldom rising above a yard high. The leaves and branches are also proportionally smaller and more numerous, and the bark of the shoots of a lighter brown, than in the other. It sometimes produces flowers with three or four rows of petals; whence the name. They are much smaller than those of the other, and flourish only once in five years, which makes it hardly worth propagating. The dwarf syringa is still of lower growth, seldom arising to more than two feet in height; and the branches and leaves are smaller and more numerous, and the bark is of a lighter brown. It never produces flowers.

2. P. inodorus, the Carolina syringa, with entire leaves, is a native of Carolina, and as yet but little known in Europe. It rises with a shrubby stalk of about sixteen feet in height, sending out slender branches from the sides opposite, garnished with smooth leaves shaped like those of the pear-tree, and standing on pretty long foot-stalks. The flowers are produced at the ends of the branches; and are large, white, spreading open, with a great number of short stamina with yellow summits. This is the tallest grower by far of the species, and makes the

grandest show when in blow, though the flowers have no smell.

3. P. nanus, with oval leaves somewhat indented, and double flowers, seldom rises above three feet; the flowers come out singly from the sides of the branches, and have a double or treple row of petals, of the same size and form, as well as the same scent, with No. 1; but it flowers very rarely. The propagation of all the sorts is very easy. 1. The most certain method is by layers; for the young twigs, being laid in the earth in winter, will be good rooted plants by autumn following. 2. These plants may be increased by cuttings, which being planted in October, in a shady moist border, many of them will grow; though it will be proper to let those of the Carolina sort remain until spring, and then to plant them in pots, and help them by a little heat in the bed. By this assistance, hardly one cutting will fail. 3. They may be also increased by suckers; for all the sorts throw out suckers, though the Carolina syringa the least of any. These will all strike root, and be fit for the nursery ground: nay, the double-flowering and the dwarf sorts are always increased this way; for these plants, having stood five or six years, may be taken up and divided into several scores. All the plants, however, whether raised from layers, cuttings, or suckers, should be planted in the nursery to get strength, before they are set out for good. They should be planted a foot asunder, and the distance in the rows should be two feet. After this, they will require no other care than hoeing the weeds, until they have stood about two years, which will be long enough for them to stand there.

PHILÆ, a town and island of Egypt, above the smaller cataract, but placed opposite Syene, by Pliny; v. c. 9.

PHILÆ, one of the Sporades Isles.

PHILÆNI, two brothers, citizens of Carthage, who sacrificed their lives for the good of their country. When the Carthaginians ruled over the greatest part of Africa, the Cyrenians were also a great and wealthy people. The country between them was sandy, and of a uniform appearance. There was neither river nor mountain to distinguish their limits, which engaged the two nations in terrible and tedious wars. At last they agreed, 'that, upon a day appointed, deputies should set out from their respective homes, and the place where they met one another should be accounted the common boundary of both nations.' Accordingly, the Philæni, sent from Carthage, made all despatch to perform their journey. The Cyrenians proceeded more slowly. These last, perceiving themselves behind, charged the Carthaginians with setting out before the time; and made a mighty bustle upon it. The Carthaginians then desired any other terms; on which the Greeks made this proposal to the Carthaginians, 'either to be buried alive in the place which they claimed as the boundary to their nation, or that they would advance forward to what place they chose upon the same condition.' The Philæni, accepting the offer, made a sacrifice of their lives to their country, and were buried alive. The Carthaginians dedicated altars in that place to the memory of the two brothers. These altars, called Aræ Philænorum, served as a boundary to the empire of the Carthaginians, which extended from this monument to Hercules's Pillars, which is about 2000 miles, or, according to the accurate observations of the moderns, only 1420 geographical miles. Sallust. de Bell. Jug.

PHILÆUS, the son of Ajax by Lysidice, daughter of Coronus, one of the Lapithæ; and a lineal ancestor of Miltiades.

PHILÆUS, the son of Augeas, king of Elis, whom Hercules placed on the throne after killing his father.

PHILANTHROPOS, from φιλεω, to love, and ανθρωπος, a man; so called from its uses. 1. A medicine which relieves the pain of the stone. 2. The herb goose-grass, because it sticks to the garments of those who touch it.

PHILAN'THROPY, *n. s.* } Gr. φιλεω and
PHILAN'THROPIST. } ανθρωπος. Love of mankind; good nature: a lover of mankind.

Such a transient temporary good nature is not that *philanthropy*, that love of mankind, which deserves the title of a moral virtue. *Addison.*

The sufferings which he underwent, and was witness to, on this occasion, made an impression upon his mind that probably was a principal cause of the *philanthropical* exertions which afterwards employed so great a portion of his life. *Aikin.*

PHILANTHROPHY is of nearly the same import with benevolence; and differs from friendship, as this last affection subsists only between individuals, whilst philanthropy comprehends the whole human species. Whether man has an instinctive propensity to love his species, which makes him incapable of happiness but in the midst of society, and impels him to do all the good that he can to others, feeling their felicity an addition to his own, is a question that has been warmly debated among philosophers. Among the philosophers of the seventeenth century, Hobbes took the unpopular side of this question; insisting that man is naturally a selfish animal, incapable of any generous principle. Lord Shaftesbury adopted the opposite side, and has been since followed by bishop Butler, Hutchinson, lord Kames, Dr. Beattie, Dr. Reid, &c., who insist that the whole duty of man results from an intuitive principle called the moral sense, from which philanthropy is inseparable. See MORAL PHILOSOPHY.

PHILATES, or FILATES, a town of Albania, pachalic of Delvino, on the ascent of Mount Montzkeli, near the small river Calamas. It is the chief place of a canton of this name. Population 2000. Twenty-five miles west by south of Joannina.

PHILBERT DE GRAND-LIEU, a village in the west of France, on the northern bank of the lake of Grand Lieu. Population 2000. Fifteen miles south by west of Nantes.

PHILELPHUS (Francis), professor of eloquence at Padua, was born in 1398. In 1429 he was sent by the republic of Venice to Constantinople, where he married the daughter of the learned Emmanuel Chrysoloras. The emperor John Paleologus sent him to the emperor Sigismund to ask assistance against the Turks. He was very learned. He died at Florence, in

1481. His works were printed at Basil, in 1739, folio.

PHILEMON, a Greek comic poet, son to Damon, and contemporary with Menander. Any advantage he had over this poet was owing less to his own merit than to the intrigues of his friends. Plautus has imitated his comedy of the Merchant. He is reported to have died laughing on seeing his ass eat figs. He was then about ninety-seven years of age.

PHILEMON the younger, son of the above, was also the author of fifty-four comedies, of which there are still extant considerable fragments collected by Grotius. These prove that he was not a poet of the first rank. He flourished about A. A. C. 274.

PHILEMON, a rich citizen of Colossæ in Phrygia, who was converted to the Christian faith, with Appia his wife, by Epaphras the disciple of St. Paul. Coloss. ii. 1. Perhaps we should have known nothing of Philemon had it not been on account of his slave Onesimus, who, having robbed and run away from him, came to Rome, where he found St. Paul, and was very serviceable to him. St. Paul converted and baptised him, and sent him back to his master Philemon; to whom he wrote a letter, still extant, which passes for a masterpiece of pathetic eloquence, and is at once natural, lively, and strong. Philemon (1, 2), had convened a church in his house; and all his domestics, as well as himself, were members. His charity, liberality, and compassion, were a sure refuge to all that were in distress. The Apostolical Constitutions say that St. Paul made him bishop of Colossæ; but the Menæa insinuate that he went to Gaza in Palestine, of which he was the apostle and first bishop. Thence he returned to Colossæ, where he suffered martyrdom, with his wife, in the time of Nero.

PHILENE, a town of Attica, between Athens and Tangara.—Stat. Theb. iv. 102.

PHILEROS, a town of Macedonia.—Pliny.

PHILETÆRUS, a eunuch, who was made governor of Pergamus by Lysimachus, whom he afterwards quarrelled with, and made himself king of that country, A. A. C. 283. See PERGAMUS. He reigned twenty years, and was succeeded by his nephew Eumenes I.

PHILETAS, a Greek poet and grammarian, of the island of Cos, who flourished under Philip and Alexander the Great, and was preceptor of Ptolemy Philadelphus. He was the author of some Elegies, Epigrams, and other works, which are not extant. He is celebrated by Ovid and Propertius, as one of the best poets of his age.

PHILETUS, a man mentioned by St. Paul, in his second epistle to Timothy, ii. 16, 17, 18, along with Hymenæus, as persons who had erred, and denied the resurrection. We have nothing very certain concerning Philetus, but a fabulous story by Abdias, in the life of St. James major, which attributes his conversion to that apostle.

PHILIATRA, PHILATREA, or FILATRA, a small town in the south-west of the Morea, in Messenia, about two miles from the sea. It is situated in a district interspersed with olives and fruit trees; the houses being scattered, but beautifully intermixed with gardens and vineyards. Six miles south-west of Arcadia.

PHILIBEG, a little plaid, called also a kilt, is a sort of short petticoat reaching nearly to the knees, worn by the Scotch Highlanders. It is a modern substitute for the lower part of the plaid, being found to be less cumbersome, especially in time of action, when the Highlanders used to tuck their brechdan into their girdle. Almost all of them have a great pouch of badger and other skins, with tassels dangling before, in which they keep their tobacco and money.

PHILIDAS, a friend of Pelopidas, one of those who joined in the conspiracy to expel the Spartans from Thebes, and in whose house they met.

PHILIDOR (Andre), a musician of Dreux, in France, was the son of Michael Danican, chamber musician to Louis XIII., and changed his name to Philidor, from a compliment paid him by that monarch, who once called him so after a famous hautbois player. He procured his son, who was born in 1726, the situation of a page, and he composed a successful mottet, with full choruses, in his twelfth year. As he grew up, his passion for the game of chess discovered itself, and in order to indulge it he travelled over great part of Europe, but by no means abandoning his musical studies. About the year 1753 he came to London, when he set to music Dryden's Alexander's Feast, an attempt which is said to have elicited the approbation of Handel. He continued in England some time, and here first printed his Analysis of Chess, a book still considered a standard work. On his return to France he became chapel-master to the queen, and devoted his attention to the comic opera. There are twenty-one operatic pieces all of his composition, one of which, Le Maréchal, in 1761, ran more than 100 nights. Philidor afterwards returned to England, and set the Carmen Seculare, esteemed the best of his works. His death took place in London in 1795. A short time previously he played two games of chess at the same time, blindfold, against two of the most distinguished amateurs, one of which he won; and the other was a drawn game.

PHILINUS, a native of Agrigentum, who fought along with Hannibal against the Romans. He wrote a history of the Punic wars.—C. Nep. Polyb.

PHILIP, the apostle, a native of Bethsaida in Galilee. It is supposed that he and Nathanael were present at the marriage at Cana. In the Upper Asia this apostle took great pains in planting the gospel, and by his preaching and miracles made many converts. In the latter part of his life, we are told, he came to Hierapolis in Phrygia, a city addicted to idolatry, and particularly to the worship of an immense serpent. St. Philip by his prayers procured the death of this monster, and convinced its worshippers of the absurdity of paying divine honors to creatures. But the magistrates, enraged at Philip's success, imprisoned him, and ordered him to be severely scourged, and then put to death, which some say, was by crucifixion; others, by hanging him up against a pillar. St. Philip is generally reckoned among the married apostles; and it is said he had three daughters, two of whom preserved their virginity, and died at Hierapolis; the third died at Ephesus. The pretended gospel, under his name was forged by the Gnostics, to countenance their bad principles and worse practices. The Christian church observes his festival, with that of St. James, on the first day of May.—Euseb. lib. iii. c. 30.

PHILIP, the second of the seven deacons, was chosen by the apostles after our Saviour's resurrection.—Acts vi. 5. This deacon, they say, was of Cæsarea in Palestine. It is certain that his daughters lived in this city.—Acts xxi. 8, 9. The modern Greeks say, that he went to Tralles in Asia, where he founded a church, of which he was the apostle and bishop; and where he rested in peace, after performing many miracles. The Latins, on the contrary, state that he died at Cæsarea, and that three of his daughters were there buried with him. It is thought that the eunuch converted by St. Philip was the first apostle of the Ethiopians; and the Abyssinians boast of having received the Christian faith from him.

PHILIP I., king of Macedonia. See MACEDON.

PHILIP II., king of Macedon, was the fourth son of Amyntas II. He was sent to Thebes as an hostage by his father, where he learned the art of war under Epaminondas, aud studied the manners and pursuits of the Greeks. He discovered, from his earliest years, that quickness of genius and greatness of courage which afterwards procured him so great a name. On the death of his brother Perdiccas III. he ascended the throne as guardian of his nephew Amyntas III., whom he got deposed, and succeeded about A. A. C. 360. The principal transactions of his life and reign being related under MACEDON, it is only necessary here to add a few characteristical anecdotes of him.—He was the first who caused gold to be coined in his name: and is said to have employed his wealth in procuring spies and partisans in all the great cities of Greece; thus making conquests without the aid of arms. At the siege of Methone, in Thrace, he received a wound in his right eye by an arrow; which was inscribed with the words, 'For Philip's right eye.' After the archer, who had shot it, had offered his services to Philip, boasting that he could hit the swiftest bird on the wing, Philip ridiculed his art by saying, 'that he would be of use, if they were to make war with starlings;' which made Aster join the enemy, and take this method of revenge. By assuming the mask of a moderator and peace-maker, he gained confidence; in attempting to protect the Peloponnesians against the encroaching power of Sparta, he rendered his cause popular; and, by ridiculing the insults offered to his person as he passed through Corinth, he displayed his moderation and philosophic virtues. In his attempts to make himself master of Eubœa, he was unsuccessful; and Phocion, who despised his gold as well as his meanness, obliged him to evacuate an island whose inhabitants were as insensible to the charms of money as they were unmoved at the horrors of war, and the bold efforts of a vigilant enemy. From Eubœa he turned his arms against the Scythians; but the advantages he obtained over that indigent nation were inconsiderable, and he again made Greece an object of plunder and rapine. His behaviour after the battle of Chæronea reflects great disgrace upon him as a man and as a monarch. In the hour of festivity, and during the entertainment he had given to celebrate his victories, Philip sallied from his camp, and with the inhumanity of a brute, insulted the bodies of the slain, and exulted over the calamities of the prisoners. His insolence, however, was checked, when Demades, one of the Athenian captives, exclaimed, 'Why do you, O king, act the part of a Thersites, when you can represent with so much dignity the elevated character of an Agamemnon?' The reproof was felt; Demades received his liberty; and Philip learned to gain popularity even among his fallen enemies, by relieving their wants and easing their distresses. At the battle of Chæronea the independence of Greece was extinguished; and Philip formed new enterprises and meditated new conquests, being appointed general of the Greeks against the Persians. But he was stopped in the midst of his warlike preparations, being stabbed by Pausanias as he entered the theatre at the celebration of the nuptials of his daughter Cleopatra. This murder has given rise to many conjectures. Many consider the repudiation of Olympias and the resentment of Alexander as the causes. The ridiculous honors which Olympias paid to her husband's murderer strengthened the suspicions against the queen; but Alexander declared that he invaded Persia to revenge his father's death upon the Persian princes, by whose intrigues the assassination had been committed. The character of Philip was that of a sagacious, artful, prudent, and intriguing monarch: he was brave in the field, eloquent and dissimulating at home, and he possessed the art of changing his conduct according to the caprices of mankind, without ever altering his purpose, or losing sight of his ambitious aims. He possessed much perseverance, and in the execution of his plans he was always vigorous. He had that eloquence which is inspired by strong passions. His assassination prevented him from achieving the greatest of his undertakings; otherwise he might have acquired as many laurels, and conquered as many nations, as his son Alexander did; and Persia might have been added to the Macedonian empire, perhaps with greater moderation, with more glory, and with more lasting advantages. The private character of Philip raises indignation. The admirer of his virtues is disgusted to find him disgracing himself among the most abandoned prostitutes, as well as by the most unnatural crimes and lascivious indulgences. He was murdered in the forty-seventh year of his age, and the twenty-fourth of his reign, about 336 years before the Christian era. His reign is interesting, and his administration a matter of instruction. He is the first monarch whose life and actions are described with accuracy and historical faithfulness. Philip was the father of Alexander the Great and of Cleopatra by Olympias; he had also by Audaca an Illyrian, Cyna, who married Amyntas, the son of Perdiccas, Philip's elder brother; by Nicasipolis a Thessalian, Nicæa, who married Cassander; by Philæna, a Larissæan dancer, Aridæus, or Philip III., who reigned some time after Alexander's death; by Cleopatra, the niece of Attalus, Caranus and Europa, who were both murdered by Olympias; and Ptolemy, the first king of Egypt, by Arsinoe, who in the first month of her pregnancy was married to Lagus. Of the many memorable sayings reported by Plutarch of this prince, the following are the most remarkable:—A poor woman had often importuned him to do her justice, but was told that he had no time to attend to her petition; whereupon she said with some warmth, 'Cease then to be a king.' Philip felt the force of this reproof, and immediately gave her satisfaction. Another woman came to ask justice from him as he was going out from a great entertainment, and was condemned: 'I appeal,' exclaimed she—'And to whom do you appeal?' said the king, 'To Philip fasting.' This answer opened the eyes of the monarch, who retracted his sentence. If he possessed any virtue it was that of suffering injuries with patience. Having learned that some Athenian ambassadors charged him, in full assembly, with atrocious calumnies: 'I am under great obligations,' said he, 'to those gentlemen, for I shall henceforwards be so circumspect in my words and actions, that I shall convict them of falsehood.' One saying of Philip, however, does him less honor than those above mentioned, viz.—'Let us amuse children with playthings, and men with oaths.' This abominable maxim gave rise to the observation, 'That he was in full length, what Louis XI. afterwards was in miniature.' It is well known that Philip had a person about him, who called out at times, 'Philip, remember that thou art mortal;' but whether we should place this to the account of his pride or his humility it is difficult to determine.

Philip III. and IV. two short-lived monarchs of Macedonia. See Macedon.

Philip V., king of Macedon, was the son of Demetrius. His infancy, at the death of his father, was protected by Antigonus, one of his friends, who ascended the throne, and reigned for twelve years with the title of independent monarch. When Antigonus died, Philip recovered his father's throne, though only fifteen years of age, and he early distinguished himself by his boldness and his ambitious views. He came to the throne in the year 220 before our Saviour, and the beginning of his reign was rendered glorious by the conquests of Aratus; a general who was as eminent for his love of justice as his skill in war. But so virtuous a character could hardly fail to be disagreeable to a prince who indulged himself in every species of dissipation and vice; and his cruelty to him soon displayed his character in its true light; for, to the gratification of every vice, he had the meanness to sacrifice this faithful and virtuous Athenian. Not satisfied with Macedonia, Philip aspired to become the friend of Annibal, to share with him the spoils which the distresses of the Romans seemed to promise. But his expectations were frustrated; the Romans discovered his intrigues; and, though weakened by the valor of the Carthaginians, they were soon enabled to meet him in the field of battle. The consul Lævinus entered Macedonia; obtained a victory over him near Apollonia, reduced his fleet to ashes, and compelled him to sue for peace. This was not permanent; and when the Romans discovered that he had assisted their formidable enemy Annibal with men and money, they appointed T. Q. Flaminius to punish his perfidy. The Roman consul, in a general engagement, fought near Cynocephale, totally defeated the monarch, who saved his life by flight, and was obliged to demand peace by his ambassadors, which was granted with difficulty. In the midst of these public calamities the peace of his family was disturbed; and Perseus, the eldest of his sons by a concubine, raised suspicions of his brother Demetrius, whose condescension and humanity had gained popularity among the Macedonians, and who, from his residence at Rome as an hostage, had gained the good graces of the senate. Philip listened to the false accusations of Perseus, that Demetrius wished to rob him of his crown. But, no sooner was Demetrius sacrificed to credulity, than Philip became convinced of his rashness; and, to punish the perfidy of Perseus, he attempted to make Antigonus, another son, his successor. But he was prevented by death, in the forty-second year of his reign, A. A. C. 178.

Philip, a native of Acarnania, physician to Alexander the Great. When that monarch had been suddenly taken ill, after bathing in the Cydnus, Philip undertook to remove the complaint, when the rest of the physicians believed that all medical assistance would be ineffectual. But, as he was preparing his medicine, Alexander received a letter from Parmenio, in which he was advised to beware of his physician Philip, as he had conspired against his life. The monarch was alarmed; and, when Philip presented him the medicine, he gave him Parmenio's letter to peruse, and began to drink the potion. The serenity and composure of Philip's countenance, as he read the letter, removed every suspicion from Alexander's breast; he pursued the directions of his physician, and in a few days recovered.

Philip, foster-brother of Antiochus Epiphanes (1 Macc. vi. 14. and 55; 2 Macc. ix. 29), was a Phrygian by birth, and very much in Antiochus's favor. This prince made him governor of Jerusalem (2 Macc. viii. 8; v. 22), where he treated the Jews very cruelly, to force them to forsake their religion. Seeing that Apollonius and Seron were defeated by Judas Maccabæus, he sent for new succours to Ptolemy governor of Cœlo-Syria, who sent him Gorgias and Nicanor with a powerful army. Some time after, Antiochus going beyond the Euphrates, to extort money from the people, Philip went along with him; and Antiochus finding himself near his end (1 Macc. vi. 14) made him regent of the kingdom, put his diadem into his hands, his royal cloak, and his ring, that he might render them to his son the young Antiochus Eupator. But Lysias having taken possession of the government in the name of the young Eupator, who was but a child, Philip not being able to cope with him, durst not return into Syria; but he went into Egypt, carrying the body of Epiphanes along with him, to implore assistance from Ptolemy Philometor against Lysias the usurper of the government of Syria. The year following, while Lysias was busy in the war carrying on against the Jews, Philip got into Syria, and took possession of Antioch: but Lysias returning into the country, with great diligence, retook Antioch, and put Philip to death, who was taken in the city.

PHILIP (M. Julius), a Roman emperor, of an obscure family in Arabia, whence he was surnamed the Arabian. From the lowest rank in the army he gradually rose to the highest offices; and, when he was made general of the pretorian guards, he assassinated Gordian to make himself emperor. To secure himself on the throne, he left Mesopotamia a prey to the continual invasions of the Persians, and hurried to Rome, where his election was approved by the senate and people. Philip rendered his cause popular by his liberality and profusion; particularly on occasion of the centenary commemoration of the foundation of the city; which was celebrated with more magnificence than under the preceding reigns. His usurpation, however, was short. He was defeated by Decius, who had proclaimed himself emperor in Pannonia; and was assassinated by his own soldiers near Verona, in the forty-fifth year of his age, and fifth of his reign. His son, who had shared with him the imperial dignity, was also massacred in the arms of his mother. Young Philip was then in the twelfth year of his age, and the Romans lamented in him the loss of rising talents, of natural humanity, and endearing virtues.

PHILIP I., king of France, succeeded his father Henry I. in 1060, when only eight years of age, under the guardianship of Baldwin V. count of Flanders, who discharged his trust with zeal and fidelity. He defeated the Gascons who were inclined to revolt, and died leaving his pupil fifteen years of age. This young prince made war in Flanders against Robert, Baldwin's younger son, who had invaded Flanders, which belonged to the children of his elder brother. Philip marched against him with a numerous army, which was cut to pieces near Mount Cassel: and the conqueror enjoyed his usurpation. Philip, after this, tired of his wife Bertha, and fond of Bertrade, wife of Folques count of Anjou, carried her off from her husband. Having, in 1093, annulled his own marriage, as well as Bertrade's with the count of Anjou, both under pretext of barrenness, Philip and she were married by the bishop of Beauvais. This union was declared void by pope Urban II., a Frenchman by birth, who pronounced the sentence in France, to which he had come for an asylum. Philip, fearing the pope's anathemas might excite his subjects to rebel, sent deputies to the pope, who obtained a delay, with permission to use the crown. This delay was not of long duration. Philip was excommunicated anew in a council held at Poictiers in 1100; but, in 1104, Lambert bishop of Arras, legate of pope Pascal II., at last brought him his absolution to Paris, after having made him promise never to see Bertrade more; a promise which he did not keep. It would appear that the pope afterwards approved their marriage; for their sons were declared capable of succeeding. Philip died at Melun the 29th of July, 1108, aged fifty-seven. See FRANCE.

PHILIP II., surnamed Augustus, with other vain titles (see FRANCE), son of Louis VII. and of Alix his third wife, daughter of Thibault count of Champagne, was born the 22d of August, 1165. He came to the crown after his father's death in 1180, at the age of fifteen. The king of England seemed willing to take advantage of his minority, and to seize upon a part of his dominions. But Philip marched against him, and compelled him, sword in hand, to confirm the ancient treaties between the two kingdoms. As soon as the war was ended, he made his people enjoy the blessings of peace. He gave a check to the oppressions of the great lords, banished the comedians, punished blasphemies, caused the streets and public places at Paris to be paved, and annexed to that capital a part of the adjacent villages. It was enclosed by walls with towers; and the inhabitants of other cities were equally proud to fortify and embellish theirs. The Jews having for a long time practised the most shameful frauds in France, Philip expelled them from his kingdom, and declared all debts due to them cancelled. The tranquillity of France was disturbed by a difference with the count of Flanders, which was terminated in 1184. Some time after he declared war against Henry II. of England, and took from him the towns of Issoudun, Tours, Mans, and other places. The epidemical madness of the crusades then agitated all Europe; and Philip caught the infection. He embarked in 1190 with Richard I., king of England, for the relief of the Christians in Palestine, who were oppressed by Saladin. These two monarchs now sat down before Acre, the ancient Ptolemais; as did almost all the Christians of the east, while Saladin was engaged in a civil war on the banks of the Euphrates. Their forces, joined to those of the Asiatic Christians, were above 300,000 fighting men. Acre surrendered the 13th of July, 1191; but the disagreement, which took place between Philip and Richard, did more mischief than could be compensated by 300,000 heroes. Philip returned to France, with a languishing disorder, which was attributed to poison, but which might have been occasioned merely by the scorching heat of a climate so different from that of France. He lost his hair, his beard, and his nails; his very flesh came off. The year after he obliged Baldwin VIII., count of Flanders, to leave him the county of Artois. He next turned his arms against Richard king of England, from whom he took Evreux and Vexin; though he had promised upon the gospels never to take any advantage of his rival during his absence. Philip, repulsed from Rouen with loss, made a truce for six months; during which he married Ingelburga, princess of Denmark, whose beauty could only be equalled by her virtue. The divorcing of this lady, whom he quitted to marry Agnes daughter of the duke of Merania, embroiled him with the court of Rome. The pope excommunicated him, but restored him upon his promising to take back his former wife.

John succeeded to the crown of England in 1199, to the prejudice of his nephew Arthur, to whom of right it belonged. The nephew, supported by Philip, took arms against the uncle, but was defeated in Poitou, where he was taken prisoner, and afterwards murdered. The murderer, king John, being summoned before the peers of France, not having appeared, was declared guilty of his nephew's death, and condemned to lose his life, in 1203. His lands, situated in France, were forfeited to the crown. Philip seized upon Normandy, carried his victorious arms into Maine, Anjou, Touraine, Poitou, and united those provinces once more to the crown of France. The English had no other part of France but the province of Guienne. To crown his good fortune, John was embroiled with the court of Rome. This ecclesiastical thunder was very favorable for Philip. Innocent II. transferred to him a perpetual right to the kingdom of England. To give the greater force to the sentence, he employed a whole year in building ships, and in preparing the finest army that was ever seen in France. Europe was in expectation of a decisive battle between the two kings, when the pope laughed at both, and artfully took to himself what he had bestowed upon Philip. A legate persuaded John to give his crown to the court of Rome. Then Philip was expressly forbid by the pope to make any attempt upon England, now become a see of the Roman church, or against John, who was under her protection. Meanwhile Philip's great preparations had alarmed all Europe; Germany, England, and the Netherlands were united against him. Ferrand, count of Flanders, Philip's vassal, joined the emperor. Philip was not disconcerted; his valor was conspicuous at the battle of Bouvines, on the 27th of July, 1214, which lasted from noon till night. Before the engagement, he had made even some of his nobles, who followed him with reluctance, zealous in his cause. The enemy had an army of 150,000 fighting men; that of Philip was not half so numerous; but it was composed of the flower of his nobility. The king run great hazard of his life; for he was thrown down under the horses' feet, and wounded in the neck. It is said 30,000 Germans were killed. The counts of Flanders and Boulogne were led to Paris in irons. The French king made no conquests on the side of Germany after this ever memorable action; but it gained him an additional power over his vassals. Philip conqueror of Germany, and possessor of almost all the English dominions in France, was invited to the crown of England by the subjects of king John, who were grown weary of his tyranny. Upon this occasion he acted like an able politician. He persuaded the English to ask his son Louis for their king. Louis made a descent upon England, was crowned at London, and excommunicated at Rome, in 1216. See England. King John's death extinguished the resentment of the English, who, having declared themselves for his son Henry III., forced Louis to leave England. Philip died at Nantes, the 14th of July, 1223, aged fifty-nine, after a reign of forty-three years. Of all the kings of the third race, he made the greatest accession to the crown lands, and transmitted the greatest power to his successors. He reunited to his dominions Normandy, Anjou, Maine, Touraine, Poitou, &c. After having subdued John he humbled the great lords, and by the overthrow of foreign and domestic enemies took away the counterpoise which balanced his authority. He was more than a conqueror; he was a great king and an excellent politician; fond of splendor on public occasions, but frugal in private life; exact in the administration of justice: skilful in employing alternately flattery and threatenings, rewards and punishments; zealous in the defence of religion and the church; but he knew well how to procure from her succours for the state. The enterprises of Philip were almost always successful; he formed his projects with deliberation, and executed them with dispatch. He began by rendering the French happy, and in the end formidable; and though he was more inclined to punish than to pardon, he was regretted by his subjects, as a great monarch, and as the father of his country.

Philip VI., the first king of France of the collateral branch of Valois, was son to Charles count of Valois, brother of Philip IV. He mounted the throne in 1328, on the death of his cousin Charles IV., after having held the regency. France was much divided in the beginning of his reign by disputes about the succession. Edward III. of England laid claim to it as grandson of Philip IV. by his mother; but Philip of Valois took possession of it as first prince of the blood. He marched to the relief of his vassal the count of Flanders, whose subjects, on account of bad usage, had taken up arms against him. He engaged the rebels at Cassel, performed prodigies of valor, and gained a signal victory on the 24th of August 1328. Having made all quiet, he devoted the time of peace to the internal regulations of his kingdom. The financiers were called to an account, and some of them condemned to death; among others Peter Remi, general of the finances, who left behind him nearly £20,000,000. He afterwards enacted various laws respecting freeholds, the appeal comme d'abus, &c., the principles of which are more ancient than the name. The year 1329 was distinguished by a solemn homage paid to Philip, by Edward III. of England, for the duchy of Guienne, upon his knees, and with his head uncovered. The interior peace of the kingdom was disturbed by disputes about the distinction of the church and state. This controversy laid the foundation of all the disputes afterwards agitated about the authority of the two powers; which contributed to confine the ecclesiastical jurisdiction within narrower limits. Soon after, Edward III. declaring war against France, he recovered those parts of Guienne of which Philip was in possession. The Flemings, having again revolted from France, joined the standard of Edward; and required that he would assume the title of king of France, in consequence of his claim to the crown; as then, agreeably to the letter of their treaty, they only followed the king of France. From this period is dated the union of the fleur-de-lis and leopards in the arms of England. Philip's arms were at first attended with some success; but those advantages were far from compensating the loss of the battle of Sluys or Ecluse, in which the French fleet, consisting of 120 large ships, and manned by 40,000 seamen, was beat by that of

England in 1340. This war, which had been alternately discontinued and renewed, began again with fury in 1345. The two armies having come to an engagement the 26th of August, 1346, near Crecy, in Ponthieu, the English gained a signal victory. See CRESSY. The loss of Calais, and several other places, was the fruit of this defeat. Some time before, Edward had challenged Philip of Valois to a single combat; which he refused, not from cowardice, but from the idea that it was improper for a sovereign prince to accept a challenge from a king who was his vassal. At length, in 1347, a truce for six months was concluded between France and England, and afterwards prolonged at different times. Philip died 23d August, 1350. He had, however, reunited Dauphiny to France. See DAUPHINY. Philip likewise added to his domain Rousillon, and a part of Cerdagne, by lending some money to the king of Majorca, who gave him those provinces as a security; provinces which Charles VIII. afterwards restored without any reimbursement. The fictitious and ideal value of the coin was also raised, and a great deal of bad money was issued from the mint. The officers of the mint were sworn upon the gospels to keep the secret; but Philip was a fool to think that so gross a fraud would not be discovered.

PHILIP I., king of Spain, was the son of the emperor Maximilian I. In 1490 he married Jane, or Joan, queen of Spain, in whose right he obtained that crown. He died in 1506, aged twenty-eight; and was succeeded by his son Charles V. See SPAIN.

PHILIP II, son of Charles V. and Isabella of Portugal, was born at Valladolid on the 21st of May 1527, and became king of Naples and Sicily by his father's abdication in 1554. He ascended the throne of Spain on the 17th of January 1556. Charles had made a truce with the French, but his son broke it; and, having formed an alliance with England, poured into Picardy an army of 40,000 men. The French were cut to pieces at the battle of St. Quintin, on the 20th of August 1557. That town was taken by assault, and the day on which the breach was mounted Philip appeared armed cap-a-pie to animate the soldiers. It was the first and last time that he ever wore this military dress. His terror was so great during the action that he made two vows; one, that he would never again be present in a battle; and the other, to build a magnificent monastery to St. Lawrence, to whom he attributed the success of his arms, which he executed at Escurial, about seven leagues from Madrid. The taking of Chatelet, Ham, and Noyon, were the only advantages derived from a battle which might have proved the ruin of France. The duke of Guise repaired the disgrace of his country by the taking of Calais and Thionville. While he was animating the French, Philip gained a battle against marshal de Thermes, near Gravelines. His army was commanded by count Egmont, whom he afterwards caused to be beheaded. He made no better use of the victory of Gravelines than he had done of that of St. Quintin; but he reaped ...ntage from the peace of Chateau Cambresis, the master-piece of his politics. By that treaty, concluded the 13th April, 1559, he gained possession of Thionville, Marienbourg, Montmedi, Hesdin, and the county of Charolois. This war, so terrible, and attended with so much cruelty, was terminated, like many others, by a marriage. Philip took for his third wife Elizabeth, daughter of Henry II., who had been promised to his own son, prince Charles, and returned in triumph to Spain, without having drawn a sword. His first care, upon his arrival at Valladolid, was to demand of the grand inquisitor an auto da fé. This was immediately granted to him; forty victims were strangled and burnt. One of them, Don Carlos de Seza, ventured to draw near to the king, and said to him, 'How, Sir, can you suffer so many wretches to be committed to the flames? Can you be witness of such barbarity without weeping?' To this Philip replied, 'If my own son were suspected of heresy, I would myself give him up to the severity of the inquisition. If an executioner were wanting, I would supply his place myself.' On other occasions he conducted himself agreeably to this intolerant spirit. At length the Flemings, no longer able to bear so hard a yoke, revolted. The revolution began with the large provinces of the continent; but the maritime provinces only obtained their liberty. In 1579 they formed themselves into a republic, under the title of the UNITED PROVINCES, which see.

Philip sent the duke of Alba to reduce them; but the cruelty of that general only served to exasperate the insurgents. Never did opposing parties fight with more courage or fury. Haerlem having surrendered at discretion, the conquerors caused all the magistrates, all the pastors, and above 1500 citizens, to be hanged. The duke of Alba being at length recalled, the grand commander of the Requesnes was sent in his place, and after his death Don John of Austria; but neither of those generals could restore tranquillity in the Lower Countries. To this son of Charles V. succeeded a grandson no less illustrious, namely, Alexander Farnese duke of Parma, the greatest man of his time; but he could neither prevent the independence of the United Provinces, nor the progress of that republic. Philip, always at his ease in Spain, instead of coming to reduce the rebels in Flanders, proscribed the prince of Orange, and set 25,000 crowns upon his head. William, superior to Philip, disdained to make use of that kind of vengeance, and trusted to his sword for his preservation. In the mean time the king of Spain succeeded to the crown of Portugal, to which he had a right by his mother Isabella. This kingdom was subjected to him by the duke of Alba, in three weeks, in 1580. Antony, prior of Crato, being proclaimed king by the populace of Lisbon, had the resolution to come to an engagement; but he was vanquished, pursued, and obliged to fly for his life. A cowardly assassin, Balthazar Gerard, by a pistol-shot killed the prince of Orange, and thereby delivered Philip from his most implacable and dangerous enemy. Philip was charged with this crime without reason; though, when the news was communicated to him, he was imprudent enough to exclaim, 'If this blow had been given two years ago, the Catholic religion and I should have gained a great deal by it.' But this murder did not restore to Philip the Seven United Provinces. That republic, already powerful by sea, assisted England against him. Philip, having resolved to distress Elizabeth, fitted out, in 1588, a fleet of 150 ships, which were partly captured, partly burnt, and partly shipwrecked; and of which very few returned. See Armada. This enterprise cost Spain 40,000,000 of ducats, 20,000 men, and 100 ships. While Philip attacked England, he was encouraging in France the Holy League; the object of which was to overturn the throne and divide the state. The leaguers conferred upon him the title of protector of their association; which he eagerly accepted, from a persuasion that their exertions would soon conduct him, or one of his family, to the throne of France. But Henry IV. embraced the Catholic religion, and made his rival lose France in a quarter of an hour. Philip, at length, exhausted by the debaucheries of his youth, and the toils of government, drew near his last hour. A slow fever, the most painful gout, and a complication of other disorders, could not disengage him from business, nor draw from him the least complaint. At last, exhausted by a complication of distempers, and being eaten up of lice, he expired the 13th of September, 1598, aged seventy-two, after a reign of forty-three years and eight months. No character was ever drawn by different historians in more opposite colors than that of Philip. From the facts recorded in history, we cannot doubt that he possessed, in an eminent degree, penetration, vigilance, and a capacity for government. He entered into every branch of administration; watched over the conduct of his ministers with unwearied attention; and in his choice both of them and of his generals discovered considerable sagacity. He never appeared to be either elated or depressed. His temper was the most imperious, and his looks and demeanor were haughty and severe; yet, among his Spanish subjects, he was of easy access, listened patiently to their complaints, and, where his bigotry did not interfere, was willing to redress their grievances. It is impossible to suppose that he was insincere in his zeal for religion. But, as his religion was of the most corrupt kind, it served only to increase the depravity of his disposition; and prompted him to commit the most odious and shocking crimes. Of the triumph of honor and humanity over the dictates of superstition, there occurs not a single instance in the whole reign of Philip; who violated the most sacred obligations as often as religion afforded him a pretence, and exercised for many years the most unrelenting cruelty, without reluctance or remorse. His ambition, which was exorbitant; his resentment, which was implacable; his arbitrary temper, which would submit to no control, concurred with his bigoted zeal for the Catholic religion to carry a sanguinary spirit to as great a height in Philip as it ever attained. Though of a small size, he had an agreeable person. His countenance was grave, his air tranquil, and one could not discover from his looks either joy in prosperity or chagrin in adversity. The wars against Holland, France, and England, cost Philip 564,000,000 of ducats; but America furnished him with more than the half of that sum. His revenues, after the junction of Portugal, are said to have amounted to 25,000,000 of ducats, of which he only laid out 100,000 for the support of his own household. Few princes have been more dreaded, or more abhorred. He had successively, if not all at once, war to maintain against Turkey, France, England, Holland, and almost all the Protestants of the empire, without a single ally. Notwithstanding so many millions employed against the enemies of Spain, Philip found in his economy and his resources wherewith to build thirty citadels, sixty-four fortified places, nine seaports, twenty-five arsenals, and as many palaces, without including the escurial. His debts amounted to 140,000,000 of ducats, of which, after having paid 7,000,000 of interest, the greatest part was due to the Genoese. He had sold or alienated a capital stock of 100,000,000 of ducats in Italy. He affected to be more than commonly devout; he ate often at the refectory with the monks; never entered their churches without kissing all the relics; caused his bread to be kneaded with the water of a fountain which was thought to possess a miraculous virtue; and boasted of never having danced. One great event of his domestic life is the death of his son Don Carlos. The manner of this prince's death is not known. His body, which lies in the monument of the escurial, is separated from his head. All that we know of the matter is, that in 1568, his father having discovered, or pretending to have discovered, that he had some correspondence with the Hollanders, his enemies, arrested him himself. He wrote at the same time to pope Pius V. an account of his son's imprisonment; and in his letter to this pontiff, the 20th of January, 1568, says, 'that from his earliest years, the strength of a wicked nature has stifled in Don Carlos every paternal instruction.' Philip II. caused to be printed at Anvers, between 1569 and 1572, in 8 vols. folio, the fine Polyglot Bible which bears his name; and he subjected the islands afterwards called the Philippines. He married successively, 1. Mary, daughter of John III. king of Portugal; 2. Mary, daughter of Henry VIII., queen of England; 3. Elizabeth of France, daughter of Henry II.; 4. Anne, daughter of the emperor Maximilian II. Don Carlos was the son of his first wife.

Philip, an island in Lake Superior, belonging to the United States. It lies towards the south side of the lake, and south-east of Isle Royal.

Philip, Fort St., a lately celebrated fortress of the island of Minorca, at the entrance of Port Mahon. The works were levelled by the Spaniards in 1805, but the houses still form a neat town.

Philip (St.), a village of Mexico, on the Rio del Norte, celebrated for a bridge of eight arches, curiously constructed. The pillars are made of neat wood work, something similar to a crate, and in the form of a keel boat, the sharp end to the current. This crate is filled with stone, in which the river has lodged sand, clay, &c., until it has become of a tolerably firm consistence. On the top of the pillars are pine logs laid lengthways, squared on two sides and joined pretty close; the whole makes a tolerable bridge for horses.

PHILIP ISLANDS, two islands in the South Pacific Ocean, discovered by captain Hunter in 1791, on his return from New South Wales. They are nearly joined together by a long sandy spit above water. Round the largest island is a sand-bank above water, which extends above half a mile into the sea. These islands are dangerous in the night to ships, on account of the sandy spits which abound here, and the land is low and barren. Long. 140° 3′ E., lat. 8° 6′ S.

PHILIP ISLAND, an island in the South Pacific Ocean, about six miles south of Norfolk Island. Also another in the South Pacific, discovered by captain Turnbull, and so named in honor of Sir Richard Philips. It is in long. 143° 57′ W., lat. 16° 24′ S. There are also two islands of this name in the south and east coast of New Holland.

PHILIPPEAU, or PHILYPEAUX (John Frederick), count of Maurepas, a French statesman, born in 1701, and in 1715, at the age of only fourteen, appointed secretary at court. In 1728 he became superintendant of the marine, and in 1738 minister of state; but in 1749 he was banished to Bourges, by the intrigues of a lady at court. In 1774 he was recalled to the ministry by Louis XVI., who placed great confidence in him. He was a man of profound learning, and great liberality; but has been blamed by the friends of the unfortunate house of Bourbon, for the advice he gave the king, to assist the American republicans to throw off their dependence on Great Britain. He did not live to see the consequences, as he died in 1781.

PHILIPPEVILLE, a town of France, in the department of the Ardennes, anciently called Corbigny, till Mary of Austria fortified it in 1577, and named it Philippeville, in honor of Philip II. of Spain. Its fortifications were renewed by Louis XIV. It is thirty-six miles north of Charleville.

PHILIPPI, in ancient geography, a town of Macedonia, in the territory of the Edones, on the confines of Thrace, situated on the side of a steep eminence; anciently called Datum and Drenides (Appian), though Strabo seems to distinguish them. This town was famous on several accounts; not only as taking its name from the celebrated Philip II. of Macedon, who considered it as a fit place for carrying on the war against the Thracians; but also on account of two battles fought in its neighbourhood between Augustus and the republican party. In the first of these battles Brutus and Cassius had the command of the republican army; while Octavianus, afterwards Augustus, and Marc Antony, had the command of their adversaries. The army of Brutus and Cassius consisted of nineteen legions and 20,000 horse; the imperial forces of an equal number of legions, but more complete, and 13,000 horse; so that the numbers on both sides were pretty equal. The troops of Brutus were richly dressed, most of them having their armour adorned with gold and silver; for Brutus, though very frugal in other respects, was thus extravagant with respect to his men, thinking that the riches that they had about them would make them exert themselves the more, to prevent these from falling into the enemy's hands. Both the republican generals appear to have been inferior in skill to Marc Antony; for as to Octavianus, he is allowed never to have conquered but by the valor of others. A little before the first engagement, Octavianus, who had been indisposed, was carried out of the camp at the persuasion of Artorius, his physician, who had dreamed that he saw a vision directing him to be removed. Brutus's men, who opposed the wing commanded by Octavianus, charged without order, which caused great confusion. However, they were successful; for part of them, taking a compass about, fell upon the enemy's rear: after which they took and plundered the camp, making a great slaughter of such as were in it, and among the rest putting 2000 Lacedemonians to the sword, who had newly come to the assistance of Octavianus. The emperor himself was sought for, but in vain, having been conveyed away for the reasons above-mentioned; and, as the soldiers pierced the litter in which he was usually carried, it was thence reported that he had been killed. This threw that whole part of the army into such consternation, that, when Brutus attacked them in front, they were most completely routed; three whole legions being cut in pieces, and a prodigious slaughter made among the fugitives. But, by the imprudence of the general in pursuing too far, the wing of the republican army commanded by Cassius was left naked and separated from the rest of the army; on which they were attacked at once in front and in flank, and thus they were defeated, and their camp taken, while Brutus imagined that he had gained a complete victory. Cassius himself retired to an eminence at a small distance from Philippi; whence he sent one of his greatest intimates to procure intelligence concerning the fate of Brutus. That general was on his way, and already in view, when the messenger set out. He soon met his friends; but they surrounding him to enquire the news, Cassius, who beheld what passed, imagined that he was taken prisoner by the enemy, retired to his tent, and in despair caused one of his freed men to cut off his head. Or at least thus far is certain, that he went into the tent with a freed man, and that his head was found separated from his body when Brutus entered. The man, we are told, was never afterwards seen. The second engagement was pretty similar to the first. Brutus again opposed Octavianus, and met with the same success; but in the mean time Antony, to whom he ought undoubtedly to have opposed himself, having to do only with the lieutenants of Cassius, gained a complete victory over them. What was worst, the fugitives, instead of leaving the field of battle altogether, fled for protection to Brutus's army; where, crowding in among the ranks, they carried despair and confusion wherever they went, so that a total defeat ensued, and the republican army was almost entirely cut in pieces. After the battle, Brutus put an end to his own life. See ROME. The city of Philippi is likewise remarkable on account of an epistle written by St. Paul to the church in that place. It was a Roman colony. Luke, Pliny, Coin, Inscription. It is also remarkable for being the birth-place of Adrastus, the peripatetic philosopher, and disciple of Aristotle. The town is still in being, but greatly decayed. However, there is an old amphitheatre, and several other monuments of its ancient grandeur.

PHILIPPIANS, Epistle of Paul to the, a canonical epistle of the New Testament, is generally agreed to have been written by St. Paul in the second year of his imprisonment at Rome, about A.D. 62. The Christian church was first planted at Philippi about the year of our Lord 51, by St. Paul; who, having made a progress through Galatia and Phrygia (Acts xvi.) and intending to pursue his tour through Bithynia, was admonished by the Spirit to go over to Macedonia. Being arrived at Philippi, he, with Timothy, Luke, and Silas, spent some days there in preaching the gospel. Though the apostle soon after left the city, Luke and Timothy continued there some time longer to carry on the work; and this was one reason why he fixed on the latter to visit the Philippians in his absence. Philip ii. 19—22. It appears from Acts xx. 6, that St. Paul made the Philippians a second visit.

This epistle, which is quite of the practical kind, seems to be designed to comfort the Philippians, under the concern they had expressed at the news of his imprisonment; to check a party spirit, that appears to have broken out among them, and to promote on the contrary an entire union and harmony of affection; to guard them against being seduced from the purity of the Christian faith by Judaizing teachers; to support them under the trials with which they struggled; and, above all, to inspire them with a concern to adorn their profession by the most exalted attainments in the divine life.

PHILIPPIC, from the invectives of Demosthenes against Philip of Macedon. Any invective declamation.

PHILIPPICS, Gr. Φιλιππικοι λογοι, in literature, a name which is given to the orations of Demosthenes against Philip II., king of Macedon. The philippics are reckoned the master pieces of that great orator: Longinus quotes many instances of the sublime in them; and points out a thousand latent beauties. Indeed that pathetic eloquence in which Demosthenes excelled, the frequent interrogations and apostrophes wherewith he attacked the indolence of the Athenians, could be no where better employed. Whatever delicacy be in the oration against Leptines, the philippics have the advantage over it, were it only on account of the subject, which gives Demosthenes so fair a field to display his chief talent, that of moving and astonishing. Dionysius Halicarnasseus ranks the oration on the Halonese among the philippics, and places it the eighth in order: but though his authority be great, yet that force and majesty wherein Cicero characterises the philippics of Demosthenes, seem to exclude the oration on the Halonese: and authorise the almost universal opinion of the learned, who reject it as spurious. Libanius, Photius, and others, but above all the languidness of the style, and the lowness of the expressions, which reign throughout the whole, seem to assign it to Hegesippus.

Philippics is a term likewise applied to the fourteen orations of Cicero against Marc Antony. Cicero himself gave them this title in his epistles to Brutus; and posterity have found it so just, that it has been continued. Juvenal, Sat. x. calls the second the divine philippic, and styles it Conspicuæ divina Philippica famæ. That orator's entitling his last and most valued orations after the philippics of Demosthenes shows the high opinion he had of them. Cicero's philippics cost him his life; Marc Antony having been so irritated with them, that when he arrived at the triumvirate, he procured Cicero's murder, cut off his head, and stuck it up in the very place whence the orator had delivered them.

The PHILIPPINE Islands, the best defined division of the Malay Archipelago, extending between the latitudes 5° and 20° N., or from Borneo nearly to Formosa: their number has been estimated at above 10,000, but 500 or 600 only are of any consequence; the remainder being merely rocks, and many not half a mile in circuit. The largest of the group is Luçon, or Luconia; to the south of which the principal islands are Mindoro, Panay, Marindique, Negros, Masbate, Zebu, Bohol, Leyte, Samar, and Magindanao: the aggregate of the whole being denominated Bisayas; also Islas de Pintados, or Painted Islands, the inhabitants having been accustomed to paint their bodies before the arrival of the Spaniards. All these islands are nominally subordinate to the Spanish government at Manilla, and some of them partially colonised, paying a tribute, collected by the corregidores, or alcaides mayores, of the provinces into which they are subdivided. Into other places, however, the Spaniards have never been able to penetrate; and the inhabitants, having escaped from their yoke into the fastnesses and inaccessible parts, wage an inveterate war against them.

These islands offer a terribly magnificent spectacle. The mountains which cross them in every direction lose their heads in the clouds, while their sides are covered with basaltes, lava, scoriæ, and other volcanic matter, and in many places are seen boiling springs and wells of liquid burning sulphur. All these appearances and phenomena are the work of extinct volcanoes, of those still in ignition, or of fires concealed in the bowels of the earth, which produce frequent and terrible earthquakes. The surface of the islands is almost universally furrowed by innumerable ravines, and has many large tracts of marsh and turf and some considerable lakes.

The same variety of seasons is found here as on the coasts of Hindostan, and proceeds from a similar cause, the chain of mountains that run through the Archipelago from north to south. During the monsoon from May to September, the rain is continual on the west coasts, and all the plains are transformed into lakes. Violent storms are also experienced at this season; while towards the north and east the winter is serene and dry. The north-east monsoon in October, however, brings similar rains and storms on these coasts. This constant humidity of the atmosphere renders these islands supereminently fertile, and preserves a perpetual verdure, not only in the trees, but on the meadows, which produce a luxuriant herbage, and are throughout the year enamelled with flowers of the most beautiful tints.

The Philippine Islands are capable of producing all colonial commodities; and their situation is most advantageous for the commerce of India, China, and America. Rice is their chief production, and the best food of the natives, who appear to have cultivated it in large quantities before the arrival of the Spaniards. The other products are different sorts of pulse, such as mongos, patani, kidney beans, and millet. The pith of the palm, the young shoots of the sugar cane, green withes, and other succulents, serve also as food, and the natives cultivate the bread fruit, beans, the cacavata, &c. They take particular care of the palm tree, as from it they procure both a spirit and an oil, together with a species of sweetmeat, named by them chanaca. The fruit trees are few in number, and of an indifferent quality, except the plantain, to which may be added the orange and mango. The areca, or betel nut, is also cultivated, and used profusely under the name of itmo. Manilla likewise produces indigo. Cotton is also raised for clothing; and dyed with indigo, log-wood, and the seed of the achiste tree. Wax, wild honey, amber, marble, tar, brimstone, and many other lesser objects, may also be named among the commercial produce.

In the interior there are mines of gold and iron, but they are little attended to; gold is also procured by washing the sand which flows in the small streams from the mountains. At Paracale the gold mines are worked, but very indolently, and scarcely so as to defray the charges. In the mountains there is excellent timber both for ship and house building, and the bamboos are very long and thick. Of these the natives construct their houses, covering them with palm leaves.

The Spaniards introduced here horses and horned cattle, which have multiplied so as to run wild among the mountains. They also introduced sheep, geese, grapes, figs, wheat, pepper, coffee, cocoa, sugar, tobacco, and various European plants, which have thriven remarkably well. Among the birds found here are the swallows, which form the edible nests so highly esteemed by the Chinese; the biche de mar, another Chinese delicacy, is also procured on the coast. On the shores are a great variety of shells and shell fish: among the rest are cowries and the enormous Kima cockle, some of which will hold a gallon, and are used for vessels of holy water in the churches.

The sloth both of the Indians and the Spaniards are here great obstacles to improvement; add to these the hurricanes which sweep away and destroy the plantations, and the destruction caused by insects, rats, and other vermin with which the country teems.

The natives carry on among themselves a barter in which gold is the medium of exchange: they carry on likewise a small trade with the Chinese and Malays of Borneo for [illegible] copper, and articles of furniture. As to [illegible]ing, they go almost naked; their rice they [illegible] in a joint of the bamboo, and eat it off a plantain leaf.

The early Spanish visitors of the Philippines seriously speak of the natives as divided into three classes; satyrs, men with tails, and monsters. It is probable they mean the various tribes of Bisayan Indians, and the strange race of oriental negroes, who still occupy the Papua Isle; the latter roaming the mountains alone in a state of nature, and subsisting on roots and such animals as they could kill with the bow and arrow. The Spaniards are of opinion that these are the original inhabitants of the Philippines, and that the Bisayans were intruders. At present the Papuas are few, and their power limited; but their hatred to the Bisayans flourishes to such perfection, that, when the latter kill a negro, it is customary for another to bind himself to his countrymen by oath that he will disappear, and will not return among them until he has killed three or four Bisayans. The Tagala tribe is principally found in the Island of Luçon; but there are several other races who inhabit these islands, who differ considerably in features and language. Such are the Pampangas who reside to the north of Manilla, and the painted races.

Among the Bisayans, the rajah, or chief, with the assistance of elders, regulates civil affairs; but in criminal cases the relations are accustomed to compound with the aggressor in gold, unless in cases of murder, when the law of retaliation is sanctioned. If the perpetrator happen to be of a different village or tribe, all the community of which the deceased was a member make it a common cause, and numbers are, in consequence, killed and made slaves on both sides. A person suspected of theft is obliged to undergo the ordeal of drawing a stone from the bottom of a cauldron of boiling water, and if he fails is fined a certain quantity of gold. Adultery is also punished by a mulct. Polygamy is not allowed; but concubines are freely kept by the principal persons.

Among certain tribes the bridegroom purchases his bride by a previous service of several years. During this probation it is incumbent on all the relations of the suitor to behave respectfully to the bride and her family, as if any insult be offered the marriage is annulled, and the female is to be disposed of a second time. The bridegroom, to console himself for his sufferings, as soon as his term of service ends, treats his wife as a slave. The marriage ceremony is performed by the immolation of a hog, which is slain by a priestess with much grimace.

Of the Ta-gala, or Gala language, there are six dialects in the island of Luçon, and two in Atton. Some of these are current in several islands, but the most general are the Tagala and Bisaya; the last of which is very barbarous, but the other more refined and polished. The alphabet consists of seventeen letters; three of these being vowels and fourteen consonants. The Tagala characters are used in Comintan, and is general among the Tagalas, who have embraced

Christianity. The idioms of this language are very complex, and it often becomes quite impossible for a person who understands all the words of a sentence to comprehend the meaning of the whole. The religious traditions of the Tagala race, their genealogies, and the feats of their gods and heroes, are carefully preserved in historical poems and songs.

In their religious ceremonies the Bisayans use neither idols nor temples, their sacrifices being offered in arbours, which they raise for that purpose; nor have they any external address to their gods. They have priestesses, whom they term babailonas or catalonas: and the sacrifices are offered alike to evil spirits and to the manes of their ancestors. They have many superstitions, one of which is respecting the Patianac, a spirit or ideal being, whose employment they state consists in preventing, by a method peculiar to itself, the delivery of a woman in labor. To counteract the malignity of this demon, the husband, having made fast the door, strips off his clothes, lights a fire, and, arming himself with a sword, flourishes it furiously about until the woman is delivered. The Tigbalang is another object of their apprehension, and is described as a phantom which assumes a variety of uncouth shapes, and interposes its authority to prevent the converted Indians from performing the duties of religion. They do not believe in any future state of reward or punishment; but they acknowledge the immortality of the soul, and suppose it to retain in the next world all the wants incident to that on earth. For this reason they place on the tomb clothes, arms, and food; and, on the fourth day, when the funeral ceremony is performed, a vacant seat is left at the table for the deceased, whom they believe to be present, although not perceptible.

These islands were discovered by Magellan in 1521; but it was not till the year 1565 that they were taken possession of by a fleet from Mexico, which first anchored off the island of Zebu, and subdued it. In 1570 a settlement was effected at the mouth of the Manilla River, and in the following year the town of that name constituted the capital of the Spanish possessions here. In 1574 the colony was attacked by a fleet of Chinese pirates, who were with difficulty repulsed.

The Spaniards in 1590 attacked the island of Sooloo or Jolo, but were in their turn repulsed with great slaughter; nor could they make any impression on the Sooloo pirates, who have for nearly three centuries been the scourge of the Philippines. The Dutch having established themselves in India, a war commenced in this neighbourhood between them and the Spaniards, which lasted nearly half a century. By A. D. 1639 the number of Chinese on these islands had increased to 30,000. In 1639 the Spaniards commenced a war against them, and made so dreadful a havock, that in a short time they were reduced to 7000, who surrendered at discretion. During this period the native Indians remained neuter, having a greater hatred to the Chinese than to the Spaniards.

In 1757 the viceroy of the Philippines expelled all the Chinese; and, in order to prevent their future establishment in the archipelago, appropriated the quarter of St. Fernando for the reception of such as should come in future on commercial pursuits.

In 1762 Manilla was taken by the English. They arrived in the bay 23rd of September, and found the Spaniards quite unprepared to receive them. On the morning of the 24th a summons was sent to the town; the troops and stores were then landed, and the city invested. On the 4th of October the batteries were opened, and the following day a practicable breach was effected. on the 6th, at day-light, the storming party mounted the breach, and the governor and principal officers were glad to surrender at discretion. At the peace in 1764 it was, however, relinquished.

Since this period the Spanish colonies in these islands have not been disturbed by European enemies, although frequently threatened with invasion from the British settlements. Besides Manilla, and the larger establishments on Luçon, they have many settlements scattered over the islands to the south, but such is the weakness of the colonial government that they have never been able to protect them against the attacks of a few despicable pirates. In February, 1809, the Spanish government of the Philippines published a declaration of their adherence to Ferdinand VII. and opened their ports to the British; after which a brisk trade arose which has been considerably injured by the revolutionary warfare in Mexico.

All kinds of India piece goods may be imported here with advantage, especially ordinary long cloth, white, blue, and red; handkerchiefs of all kinds; chintz, principally dark grounds; Surat goods of most sorts, and all kinds of cutlery and iron. The exports are birds' nests, cassia, gold dust, pepper, rattans, sago, tortoise shell, wax, wild honey, amber, marble, tar, brimstone, and many inferior articles. From 1802 to 1806 there were imported into Manilla, from the British settlements in India, goods and treasure to the amount of 2,859,822 rupees, equal to about £286,000; the exports during the same period amounted to 5,163,564, equal to about £516,356. Junks also come to these islands from China, bringing various articles for the consumption of the resident Chinese, silk goods, lackered ware, teas, China ware, &c., for the Acapulco ships. Their returns are principally in dollars, cochineal, or black wood.

Philippines, a religious society of young women at Rome, so called from their taking St. Philip de Neri for their protector. It consists of 100 poor girls, who are brought up till they are of age to be married, or become nuns, under the direction of religious women. They wear a white veil, and black cross.

PHILIPPISTS, a temporary sect among the Lutherans; the followers of Melancthon. He had strenuously opposed the Ubiquists, who arose in his time; and, the dispute growing still hotter after his death, the university of Wittemberg, who espoused Melancthon's opinion, were called by the Flacians, who attacked it, Philippists.

PHILIPPOPOLI, or Filibi, a considerable

town of Greece, in Macedon, situated on a small island formed by the Marizza, which is here navigable. It was founded by Philip, the father of Alexander the Great; and, before the earthquake which took place here in 1818, was a thriving place, containing 30,000 inhabitants, a considerable number of whom were Greek Christians, and had an archbishop. It had several handsome baths and mosques, but the above calamity greatly reduced the place. The chief existing manufactures are woollens and cotton yarn; rice is also largely cultivated in the neighbourhood. Ninety-five miles W. N. W. of Adrianople, and 225 W. N. W. of Constantinople.

PHILIPPON DE LA MADELEINE (Louis), born at Lyons in 1734, studied the law at Besançon, where he settled, and filled several public offices. In 1795 he was created librarian of the ministry of the interior, and on the Restoration, in 1814, received a pension from monsieur, now Charles X. He died in 1818, having published the following works:—Jeux d'un Enfant du Vaudeville; Choix de Chansons de M. Philippon de la Madeleine; L'Elève d'Epicure; Discours sur la Necessité et les Moyens de supprimer les Peines Capitales; Manuel et nouveaux Guide du promeneur aux Tuilleries; Grammaire des Gens du Monde; Dictionnaire portatif des Poetes Françaises morts depuis 1050, jusqu'en 1804, preceded by an abridged history of French poetry; Dictionnaire portatif des Rimes; Voyages de Cyrus, par Ramsay; Morceaux choisis des Caractéres de la Bruyere, with a notice on the author. Philippon also wrote several comedies, in conjunction with MM. Leger, Therigny, viscount Segur, and the prevost d'Iray.

PHILIPS (Ambrose), an English poet, descended from a very ancient family in Leicestershire, was educated at St. John's College, Cambridge, where he wrote his pastorals, which acquired him at the time so high a repuation. His next performance was the Life of Archbishop Williams, written, according to Cibber, to make known his political principles, the archbishop, who is the hero of his work, being a strong opponent to the high church measures. When he quitted the university, and came to London, he became a constant attendant at Button's coffeehouse, where he became intimate with the most celebrated geniuses of that age, particularly with Sir Richard Steele, who, in the first volume of his Tatler, inserted a poem of Mr. Philips's, called a Winter Piece, dated from Copenhagen, on which he bestows the highest encomiums; and, indeed, so much justice is in these his commendations, that even Pope himself, who had a fixed aversion for the author, while he affected to despise his other works, used always to except this. He wrote several dramatical pieces: The Briton; Distressed Mother; and Humphrey Duke of Gloucester, all of which met with success, and one of them is still a standard of entertainment at the theatres, being generally repeated several times every season. Mr. Philips's circumstances were in general, not only easy, but affluent, from his being connected, by his political principles, with persons of great consequence. He was concerned with Dr. Hugh Boulter, afterwards archbishop of Armagh, the right honorable Richard West, esq., lord chancellor of Ireland, bishop Burnet, and the Rev. Henry Stephens, in writing a series of papers called the Free Thinker, which were all published together by Mr. Philips, in 3 vols. 12mo. In the end of queen Anne's reign he was secretary to the Hanover club, a set of noblemen and gentlemen who had formed an association in honor of that succession, and for the support of its interests. Mr. Philips's station in this club, with the zeal shown in his writings, recommended him to the favor of the new government. He was, soon after the accession of king George I., put into the commission of the peace, and appointed a commissioner of the lottery. And, on Dr. Boulter's being made primate of Ireland, he accompanied that prelate across St. George's Channel, where he got considerable preferments, and was elected a member of the house of commons for Armagh. At length, having purchased an annuity for life of £400 per annum, he came over to England some time in 1748, but died soon after, at his lodgings near Vauxhall in Surrey. 'Of his personal character,' says Dr. Johnson, 'all I have heard is, that he was eminent for bravery and skill in the sword, and that in conversation he was solemn and pompous.'

PHILIPS (Catharine), an ingenious lady, daughter of Mr. John Fowler, merchant, born at London in January, 1631, and educated at Hackney. She married James Philips of the priory of Cardigan, esq., and went with the viscountess of Dungannon into Ireland, where she translated Corneille's tragedy of Pompey into English, which was several times acted there with great applause. She translated also the four first acts of Horace, another tragedy of Corneille, the fifth being done by Sir John Denham. This lady died of the small-pox in London, 22d June, 1664, much and justly regretted; 'having not in it,' says Langbaine, 'any of her sex her equal in poetry.'

PHILIPS (Fabian), author of several books relating to the ancient customs and privileges of England, was born at Prestbury in Gloucestershire, September 28th, 1601. He studied at the inns of Chancery, and the Middle Temple, where he became learned in the law. In the civil wars he was a bold assertor of the king's prerogative, and, two days before Charles I. was beheaded, he wrote a protestation against the intended murder, and caused it to be printed, and affixed to posts in all public places. He likewise published in 1649, 4to., a pamphlet entitled Veritas Inconcussa; or King Charles I. no Man of Blood, but a Martyr for his People; which was reprinted in 1660, 8vo. In 1653, when the courts of justice at Westminster, especially the Chancery, were voted down by Oliver's parliament, he published Considerations against the dissolving and taking them away; for which he received the thanks of William Lenthal, esq., speaker of parliament. He was for some time filazer for London, Middlesex, Cambridgeshire, and Huntingdonshire, and spent much money in searching records, in writing in favor of the royal prerogative. The only reward he received was the place of one of the commissioners for regulating the law, worth £200 per annum, which lasted two years. A the Restoration, when the bill for taking away the tenures was depending in parliament, he wrote and published a book to show the necessity of preserving them, entitled Tenenda non tollendæ; or the Necessity of preserving Tenures in capite, and by Knight's-service, which were a great part of the salus populi, &c., 1660, 4to. In 1663 he published The Antiquity, Legality, Reason, Duty, and Necessity of Preemption and Pourveyance for the King, 4to.; and afterwards many other pieces upon similar subjects. He assisted Dr. Bates in his Elenchus Motuum. He died November 17th, 1690, in his eighty-ninth year, and was buried at Twyford in Middlesex. His manner of writing is neither close nor well digested. He published a political pamphlet in 1681, entitled Ursa Major et Minor, showing that there is no such Fear, as is factiously pretended, of Popery, and arbitrary Power.

Philips (John), an eminent English poet, was born in 1676. He was educated at Winchester and Oxford. The first poem which distinguished him was his Splendid Shilling, published in 1705. His next was Blenheim. In 1706 he finished another poem upon Cyder. He also wrote a Latin ode to Henry St. John, esq., which is esteemed a masterpiece. He was contriving greater things; but, his health failing, he was obliged to drop every thing but the care of it. This care, however, did not save him; for, after lingering a long time, he died at Hereford, February 15th, 1708, of a consumption and asthma, before he had reached his thirty-third year. He was interred in the cathedral of that city, and had a monument erected to his memory in Westminster Abbey, by Sir Simon Harcourt, afterwards lord chancellor, with an epitaph written by Dr. Atterbury.

Philips (Thomas), a learned English Catholic, born at Ickford in Buckinghamshire, in 1708, and educated at Louvain. He was afterwards sent over as a missionary to England, where he published a Letter to a Student in Divinity, and other tracts. But the work for which he is most celebrated is his Life of Cardinal Pole, in 2 vols. 8vo., wherein he endeavoured to soften the harsh features of popery, and to wash his church from her stains of blood and tyranny. Several English divines published answers to this work, particularly Dr. Neve, Dr. Gloster Ridley, &c. Philips died at Liege in 1774.

PHILIPSBURG, a town of Baden, about half a mile from the Rhine. It was long fortified, and one of the strongest places in Germany; but was at last allowed to go to decay, and in the wars of the French revolution completely dismantled. Its situation is in the midst of marshes, which make it unhealthy. The celebrated duke of Berwick, son of James II. of England, was killed by a cannon ball, while visiting the trenches before this place, 12th June, 1734. Population 1100. Five miles south of Spire, and fourteen north of Carlsruhe.

Philipsburgh, a rising settlement of Lower Canada, on the eastern coast of Missiqui Bay, about one mile from the boundary line between Lower Canada and the territories of the United States. It is a neat place, but chiefly built of wood.

PHILISTÆA, in ancient geography, the country of the Philistines: which lay along the Mediterranean, from Joppa to the boundary of Egypt, and extending to inland places not far from the coast. It is also called Palestina (Josephus), a name afterwards applied to the whole of the Holy Land. See Palestina.

PHILISTÆI, or Philistim, the people of Philistæa, called also Caphtorim and Philistini, originally from Egypt, and descendants of Ham. Moses. They expelled and destroyed the Hivites the ancient inhabitants, and occupied their country; that is, the regions which retained the name of Philistim, in which that of Caphtorim was swallowed up.

PHILISTINES, Philistini, the ancient inhabitants of Palestine, well known in sacred history. The people are sometimes called in Scripture Cherethites and Caphtorims. The earlier part of their history is, like that of most other nations, very obscure and uncertain. The authors of the Universal History tell us that they were descended partly from the Casluhim, and partly from the Caphtorim, both from Mizraim, the son of Ham, the son of Noah. Moses tells us (Deut. xi. 23) that they drove out the Avim, or Avites, even to Azzah, or Gazah, where they settled; but when this happened cannot be determined. But our learned authors are clearly of opinion that the Casluhim and Caphtorim, from whom the Philistines are descended, came originally from Egypt, and called the country which they had conquered by their own name. See Palestine. Many interpreters, however, think that Caphtor was but another name for Cappadocia, which they imagine to have been the original country of the Philistines. But father Calmet, in a particular dissertation prefixed to the first book of Samuel, endeavours to show that they were originally of the Isle of Crete. The reasons which led him to think that Caphtor is the Isle of Crete are as follow:—The Philistines were strangers in Palestine, as appears in various parts of Scripture, such as Gen. x. 14; Deut. ii. 23; Jer. xlvii. 4; and Amos ix. 7, whence the Septuagint always translate this name strangers. Their proper name was Cherethims. See Ezekiel xxv. 16; Zephaniah ii. 5; and 1 Samuel xxx. 14. The kings of Judah had foreign guards, called the Cherethites and Pelethites, who were of the number of the Philistines. 2 Sam. xv. 18. The Septuagint, under the name Cherethites, understood the Cretans; and by Chereth they understood Crete. Besides, the Scripture says that the Philistines came from the Isle of Caphtor. Now we see no island in the Mediterranean, wherein the marks whereby the Scripture describes Caphtor and Cherethim, agree better than in the Isle of Crete. The name Cretim or Cherethim is the same with that of Cretenses. The Cretans are one of the most ancient and celebrated people who inhabited the islands of the Mediterranean. They pretended to have been produced originally out of their own soil. This island was well peopled in the time of the Trojan war. Homer calls it the island with 100 cities. The city of Gaza in Palestine went by the name of Minoa (Steph. Byzant. in Gaza) because Minos, king of Crete, coming into that country, called this ancient city by his own name. Herodotus acknowledges that the Cretans were originally all barbarians, and did not come from Greece. Homer says that a different language was spoken in the Isle of Crete; that there were Greeks there, true, or ancient Cretans, Pelasgians, &c. The ancient Cretans are the same as the Cherethites, the Pelasgians as the Philistines or Pelethites of the Scripture: their language was the same with that of the Canaanites or Phœnicians, that is, Hebrew: they were descended, as well as Canaan, from Ham, by Mizraim (Gen. x. 6, 13, 14). The manners, arms, religion, and gods of the Cretans and Philistines were the same. The arms of both were bows and arrows. Dagon, the god of the Philistines, was the same as the Dictynna of the Cretans. But Mr. Wells does not think these arguments convincing. He is of the same opinion with the authors of the Universal History, who say that Coptus, the name of an old city of Egypt, is a corruption of the ancient Caphtor. But whether they came from Crete, from Cappadocia, or from Egypt, they had certainly been a considerable time in the land of Canaan when Abraham arrived there, in the year of the world 2083. They were then a very powerful people, were governed by kings, and in possession of several considerable cities. Several of their kings then in power were named Abimelech. This race, however, was but of short duration, for their monarchy was changed to an aristocracy of five lords, who were partly independent of each other, though they acted in concert for the common cause. This form of government was again succeeded by another race of kings, among whom the prevailing names were Achish and Abimelech. They were not comprehended in the number of nations devoted to extermination, and whose territory the Lord had promised to the Hebrews; nor were they of the cursed seed of Canaan. However, Joshua gave their lands to the Hebrews. Josh. xv. 45, 47; and xiii. 2, 3. But these conquests of Joshua must have been ill maintained, since under the Judges, under Saul, and at the beginning of the reign of David, the Philistines oppressed the Israelites. Shamgar, Samson, Samuel, and Saul, indeed made head against them, but did not reduce their power; and they continued independent down to the reign of David, who conquered them. They continued in subjection to the kings of Judah down to the reign of Jehoram, son of Jehoshaphat, that is, for about 246 years. However, Jehoram made war against them, and probably reduced them to his obedience again; as they revolted again from Uzziah, who kept them in subjection during his reign. 2 Chr. xxi. 16, and xxvi. 6, 7. During the unfortunate reign of Ahaz, the Philistines made great havock in the territories of Judah; but his son Hezekiah subdued them. 2 Chr. xxviii. 18, and 2 Kings xviii. 8. Lastly, they regained their full liberty under the later kings of Judah; and we find from the vengeance denounced against them by the prophets Isaiah, Amos, Zephaniah, Jeremiah, and Ezekiel, that they brought many hardships and calamities upon the children of Israel: for which cruelties God threatened to punish them. Esarhaddon besieged Ashdod, and took it. Isa. xx. 1. And according to Herodotus, Psammeticus, king of Egypt, took the same city, after a siege of twenty-nine years. There is great probability that Nebuchadnezzar, when he subdued the Ammonites, Moabites, Egyptians, and other nations, bordering upon the Jews, reduced also the Philistines. After this they fell under the dominion of the Persians; then under that of Alexander the Great, who destroyed Gaza, the only city of Phœnicia that durst oppose him. After the persecution of Antiochus Epiphanes, the Asmonæans subjected under their obedience several cities of the Philistines; and Tryphon gave to Jonathan Maccabæus the government of the whole coast of the Mediterranean, from Tyre as far as Egypt, which included all the country of the Philistines.

PHILISTIS, an ancient queen, whose coin is still extant, but of whose life, reign, country, and government, nothing is recorded, or can now be ascertained. Her coin is also mentioned by Herodotus, which shows that she must have flourished before the time of that ancient historian, but nothing else is recorded by him respecting her. Mr. Pinkerton thinks she reigned in Sicily, and as a confirmation of this conjecture mentions some inscriptions of ΒΑΣΙΛΙΣΣΑΣ ΦΙΛΙΣΤΙΔΟΣ on the Grædini of the theatre at Syracuse; but which do not appear to be older than the times of the Romans. Some authors think she reigned in Malta or Cossara, but Mr. Pinkerton does not think this probable.

PHILISTUS, an ancient historian, born in Syracuse. He enjoyed the friendship of Dionysius; but, being afterwards exiled, he wrote a History of Sicily, in twelve books, which was much admired. He was afterwards recalled, and sent against the Syracusans by Dionysius the younger, but, being defeated, killed himself, A. A. C. 356.

PHILLIPSITE, a new mineral accompanying hersc' elite. Form of the crystals the same as harmotome; but phillipsite contains silica, alumina, potassa, and lime, without any trace of barytes, as is manifest by putting a drop of sulphuric acid into their solutions in the nitric or muriatic. *Annals of Philosophy*, X. 362.

PHILLYREA, mock privet; a genus of the monogynia order and diandria class of plants; natural order forty-fourth, sepiariæ. Each flower contains two males and one female. Some say there are seven species, all shrubby plants, and natives of France or Italy. Others reckon only three species, viz.

1. P. angustifolia, the narrow-leaved phillyrea, or mock privet, a deciduous shrub, native of Spain and Italy. This is of low growth, seldom rising higher than eight or ten feet. The branches are few and slender, but they are beautifully spotted with gray spots. The leaves stand opposite by pairs. They are long and narrow spear-shaped, and undivided, of a deep green color, and of a thick consistence. The edges are entire, and they stand on short foot-stalks. The flowers make no show. They are whitish, and grow in clusters from the wings of the branches, in March, and are succeeded by small round black berries. The varieties of this species

are, the rosemary phillyrea, lavender phillyrea, striped phillyrea, &c.

2. P. latifolia, the broad leaved phyllyrea, or mock privet, a tall evergreen shrub, a native of the south of Europe. It will grow to about twelve feet high. The branches are strong and upright. The bark is of a gray color, spotted with white, which has a pretty effect; and the leaves grow opposite by pairs. They are of a heart-shaped oval figure, of a thick consistence, and a strong dark green color. Their edges are sharply serrated, and they stand on short strong foot-stalks. The flowers grow from the wings of the leaves in clusters, in March. They are of a kind of greenish-white color, make no show, and are succeeded by small round black berries. There are three varieties, viz. the ilex-leaved phillyrea, the prickly phillyrea, and the olive phillyrea with slightly serrated edges.

3. P. media, the oval-leaved phillyrea, or mock privet, or the medial-leaved phillyrea, a tall evergreen shrub, native of the South of Europe. It has also three varieties, viz. 1. the common smooth-leaved phillyrea. This plant grows to twelve or fourteen feet high, and the branches are very numerous. The older branches are covered with a dark brown bark, but the bark on the young shoots is of a fine green color. They are oval, spear-shaped, and grow opposite, by pairs, on strong short foot-stalks. The flowers are produced in clusters from the wings of the young branches. They are small, and of a greenish-white color; they appear in March, and are succeeded by berries, which are first green, then red, and black in autumn when ripe. 2. The privet-leaved phillyrea grows to ten or twelve feet high, and the branches are covered with a brown bark. The leaves a little resemble the privet; they are of a fine green color, and grow by pairs on the branches. They are of a lanceolate figure, and their edges are entire, or nearly so; for some signs of serratures sometimes appear. The flowers grow in clusters in March. They are whitish, and are succeeded by small black berries. 3. The olive-leaved phillyrea is the most beautiful of all the sorts. It will grow to about ten or twelve feet high; and the branches, which are not numerous, spread abroad in a free easy manner, which give the tree a fine air. They are long and slender, covered with a light brown bark; and on these the leaves stand opposite by pairs at proper intervals, on short foot-stalks. They resemble those of the olive-tree, and are of a delightful green. Their surface is exceedingly smooth, their edges are entire, and the membrane of a thickish consistence. The flowers are small and white, and like the other sorts make no show. They are succeeded by single roundish berries. All these species may be either propagated by seeds or layers. 1. By seeds. These ripen in autumn, and should be sown soon after. The mould must be made fine; and, if it is not naturally sandy, if some drift sand be added it will be so much the better. The seeds for the most part remain until the second spring before they come up; and, if they are not sown soon after they are ripe, some will come up even the third spring after. They must be sown about an inch deep; and during the following summer should be kept clean from weeds. After they are come up, the same care must be observed, and also watering in dry weather; and if the beds are hooped, and the plants shaded in the hottest season, so much the better. But at the approach of winter they must be hooped, and the beds covered with mats in the hardest frosts, otherwise there will be danger of losing the whole crop; for these trees, though they are very hardy when grown tolerably large, are rather tender whilst seedlings. They should remain in the seed beds with this management for two summers; and then waiting for the first autumnal rains in September or October (and having prepared a spot of ground), they should at that juncture be planted out, on which they will immediately strike root. The distance from each other need not be more than a foot, if they are not designed to remain long in the nursery. If there is a probability of their not being wanted for some years, they should be allowed nearly double that distance; and every winter the ground in the rows should be well dug, to break their roots, and cause them to put out fresh fibres, otherwise they will be in danger of being lost when brought into the shrubbery quarters. 2. By layers they will easily grow. The autumn is the best time for this operation, and the young shoots are fit for the purpose. The best way of layering them is by making a slit at the joint; though they will often grow well by a twist being only made. When the gardener chooses the method of twisting a young branch for the layers, he must be careful to twist it about a joint so as only to break the bark; for, if it be too much twisted it will die. But, if it be gently twisted, it will, at the twisted parts, strike root, and by autumn following, as well as those layers that had been slit, will have good root; the strongest of which will be fit for planting where they are wanted to remain, whilst the weaker and worst rooted layers may be planted in the nursery ground like the seedlings, and treated accordingly.

PHILLYREASTRUM, a genus of plants in Vaillant's system of botany; called morinda by Linnæus.

PHILO, an ancient Greek writer, who was of a noble family among the Jews, and flourished at Alexandria during the reign of Caligula; to whom he was sent at the head of an embassy from the Jews, to defend them against Appion, A.D. 42. The best edition of his works was published at London in 1742 by Dr. Mangey, in 2 vols. folio. For farther particulars respecting this celebrated man, see Josephus's Antiq.; Eusebius's Eccl. Hist.; St. Jerome De Script. Eccles. Fabr. Bibl. Græc.; Cave Hist. Liter. and Mon. of the Greek Church, vol. 2.

PHILO, a native of Byblos, a grammarian, who flourished in the first century, and acquired celebrity by his works; the chief of which is Sanchoniathon's History of Phœnicia, which he translated into Greek. Some fragments are extant.

PHILO, a celebrated architect and writer of Byzantium, who flourished about A.A.C. 300. He wrote a treatise on Machines used in War, which is extant, in the Mathematici Veteres, 1693, folio. There is also ascribed to him, but on dubious grounds, a work, entitled De vii. Orbis Spectaculis; Romæ, 1640.

PHILOBŒOTUS, a mountain of Bœotia.

PHILOCHORUS, an ancient Greek historian, who wrote a history of Athens in seventeen books, which has not come down to us. He died A. A. C. 222.

PHILOCLES, an admiral of the Athenian fleet during the Peloponnesian war. He recommended to his countrymen to cut off the right hand of such of the enemies as were taken, that they might be rendered unfit for service. His plan was adopted by all the ten admirals except one; but their expectations were frustrated, and, instead of being conquerors, they were totally defeated at Ægospotamos by Lysander, and Philocles was put to death with the rest of his colleagues.

PHILOCRATES, an ancient author, who wrote a History of Thessaly.

PHILOCTETES, in fabulous history, the son of Pæan, was the faithful companion of Hercules: who, at his death, obliged him to swear not to discover the place where his ashes were interred, and presented him with his arrows dipped in the Hydra's blood. The Greeks at the siege of Troy being informed by an oracle that they could never take that city without those fatal arrows, went to Philoctetes, and insisted upon his discovering where he had left his friend; when Philoctetes, to evade the guilt of perjury, let them know where Hercules was entombed, by stamping upon the place; but he was punished for the violation of his oath, by dropping an arrow upon that foot; which, after giving him great agony, was at length cured by Machaon. He was afterwards taken by Ulysses to the siege of Troy, where he killed Paris with one of his arrows.

PHILOCYPRUS, a king of Cyprus in the age of Solon, by whose advice he changed the situation of a city, which, in gratitude to the Athenian legislator, he named Soli.

PHILOLAUS, of Crotona, a celebrated philosopher of antiquity, of the school of Pythagoras, to whom that philosopher's Golden Verses have been ascribed. 'He was,' says Dr. Enfield, 'a disciple of Archytas, and flourished in the time of Plato. It was from him that Plato purchased the written records of the Pythagorean system. Interfering in affairs of state, he fell a sacrifice to political jealousy. Philolaus treated the doctrine of nature with great subtlety, but with great obscurity; referring every thing that exists to mathematical principles. He taught that reason, improved by mathematical learning, is alone capable of judging concerning the nature of things; that the whole world consists of infinite and finite; that number subsists by itself, and is the chain which by its power sustains the eternal frame of things; that the Monad is not the sole principle of all things, but that the Binary is necessary to furnish materials, from which all subsequent numbers may be produced; that the world is one whole, which has a fiery centre, about which the ten celestial spheres revolve, heaven, the sun, the planets, the earth, and the moon; and the sun has a vitreous surface, whence the fire diffused through the world is reflected, rendering the mirror from which it is reflected visible; that all things are preserved in harmony by the law of necessity; and that the world is liable to destruction both by fire and by water. From this summary of the doctrine of Philolaus it appears probable that, following Timæus, whose writings he possessed, he so far departed from the Pythagorean system as to conceive two independent principles in nature, God and matter, and that it was from the same source that Plato derived his doctrine upon this subject.'

PHILOL'OGER, *n. s.* PHILOL'OGY, PHILOLOG'ICAL, *adj.* } Gr. φιλολογος. One whose chief study is language; the study of languages.

It is not good to look too long upon these turning wheels of vicissitude, lest we become giddy: as for the *philology* of them, that is but a circle of tales. *Bacon.*

Philologers and critical discoursers, who look beyond the shell and obvious exteriors of things, will not be angry with our narrower explorations. *Browne.*

You expect that I should discourse of this matter like a naturalist, not a *philologer*. *Boyle.*

The best *philologers* say, that the original word does not only signify domestick, as opposed to foreign, but also private, as opposed to common. *Sprat's Sermons.*

Temper all discourses of *philology* with interspersions of morality. *Walker.*

Studies, called *philological*, are history, language, grammar, rhetorick, poesy, and criticism. *Watts.*

PHILOLOGY is composed of φιλος, a lover, and λογος, a word, and imports the desire of investigating the properties and relations of words, or language; yet it has often been used in a more extensive signification: and has comprehended the study of grammar, criticism, etymology, the interpretation of ancient authors, antiquities; and, in a word, every thing relating to ancient manners, laws, religion, government, language, &c.

This seems any thing but an adherence to precision in matters which particularly require it. Returning to the proper signification of the term, our article GRAMMAR may be referred to as containing some original and comprehensive observations on the first principles of written or spoken language, i. e. of philology: the article LANGUAGE supplies, after Adelung, a complete sketch of the 'General History of Languages.' We need here only add,

Languages, in general, may be divided into,

1. Ancient languages; which are those that have become extinct with the people who spoke them, or have been so altered and disfigured that they no longer resemble the languages which were spoken by those people.

2. Oriental languages; the study of which is necessary in order to the understanding of the text of the Holy Scriptures, especially the Old Testament.

3. Learned languages; which are those that are indispensably necessary in the study of polite literature; and the critical knowledge of any of the modern tongues: which, while there were people in the world who made them their com-

mon language, were called living; but, as no nation now makes use of them, they are called dead languages, and are therefore to be learned from books or in schools.

4. Modern languages; in which are distinguished, first, the common languages of the European nations; and, secondly, the languages of the people who inhabit the other parts of the world. See LANGUAGE.

PHILOMATHES, a lover of learning or science.

PHILOMBROTUS, an archon of Athens, during whose government, the republic being distracted by factions, the regulation of the state was entrusted to Solon, who, by his wisdom and integrity, brought the citizens to a right understanding.

PHIL'OMEL, *n. s.* } From Philomela.
PHILOME'LA. } Changed into a bird.
The nightingale.

> Time drives the flocks from field to fold,
> When rivers rage, and rocks grow cold,
> And *philomel* becometh dumb. *Shakspeare.*
> Admires the jay the insects gilded wings,
> Or hears the hawk, when *philomela* sings? *Pope.*
> The shepherd touched his reed; sweet *Philomel*
> Essayed, and oft essayed, to catch the strain,
> And treasuring, as on her ear they fell,
> The numbers, echoed note for note again.
> *Cowper.*

PHILOMELA, in fabulous history, a daughter of Pandion king of Athens, and sister to Procne, who had married Tereus king of Thrace. Procne, being much attached to Philomela, became melancholy till she prevailed upon her husband to go to Athens and bring her sister to Thrace. Tereus obeyed; but had no sooner obtained Pandion's permission to conduct Philomela to Thrace, than he fell in love with her, dismissed the guards, offered violence to Philomela, and cut out her tongue that she might not discover his barbarity and villany. He then confined her in a lonely castle; and, returning to Thrace, told Procne that Philomela had died by the way. On this Procne put on mourning for Philomela; but a year had scarcely elapsed before Philomela, having described on a piece of tapestry her misfortunes and the brutality of Tereus, privately conveyed it to Procne, who hastened to deliver her sister from confinement, and concerted with her measures for punishing Tereus. During the festival of Bacchus she murdered her son Itylus, then in the sixth year of his age, and served him up as food before her husband. Tereus, in the midst of his repast, called for Itylus; when Procne informed him that he was then feasting on his flesh, and Philomela, throwing on the table the head of Itylus, convinced him of the reality of the story. He now drew his sword to punish the parricidal sisters, but was changed, we are told, into a hoopoe, Philomela into a nightingale, Procne into a swallow, and Itylus into a pheasant. This tragedy happened at Daulis in Phocis; but Pausanias and Strabo, who mention the story, are silent about the transformation; and the former observes that Tereus, after this bloody repast, fled to Megara, where he killed himself. The inhabitants raised a monument to his memory, where they offered yearly sacrifices, and placed pebbles instead of barley. On this monument the hoopoes were first observed. Procne and Philomela died through excess of grief; and, as the voices of the nightingale and swallow are peculiarly mournful, the poets embellished the fable by the supposed metamorphoses.

PHILOMELUM, a town of Phrygia.

PHILOMELUS, or, as Plutarch calls him, PHILOMEDES, a general of Phocis, who plundered the temple of Apollo at Delphi. See PHOCIS. He died A.A.C. 354.

PHIL'OMOT, *adj.* Corrupted from French *feuille morte*. A dead leaf. Colored like a dead leaf.

> One of them was blue, another yellow, and another *philomot*; the fourth was of a pink color, and the fifth of a pale green. *Addison.*

PHILONIUM, in pharmacy, a kind of somniferous anodyne opiate, taking its name from Philo the inventor.

PHILONIZE. Lat. philonizo. To imitate the style and sentiments of Philo. This verb, and its companion Platonize, owe their derivation and existence to the circumstance of Philo, the Alexandrian Jewish philosopher, having imbibed the philosophical principles of Plato so thoroughly, and imitated his manner so closely, that in reading Philo's works it became a proverbial saying, 'Aut Plato Philonizat, aut Philo Platonizat,' i.e. 'Either Plato Philonizes, or Philo Platonizes.' See PHILO.

PHILONUS, a village of Egypt.

PHILOPATER, a surname of the fourth Ptolemy. See EGYPT and PTOLEMY.

PHILOPŒMEN, a celebrated general of the Achæan league, born in Megalopolis, in Peloponnesus. He was no sooner able to bear arms than he entered among the troops which Megalopolis sent against Laconia. When Cleomenes III., king of Sparta, attacked Megalopolis, Philopœmen displayed much courage. He signalised himself no less in the battle of Sellasia, where Antigonus defeated Cleomenes. Antigonus made very advantageous offers to gain him over to his interest; but he rejected them. He went to Crete, then engaged in war, and served several years as a volunteer, till he acquired a complete knowledge of the military art. On his return home he was appointed general of the horse; in which command he behaved so well, that the Achæan horse became famous all over Greece. He was soon after appointed general of all the Achæan forces, when he applied himself to re-establish military discipline among the troops of the republic, which he found in a very low condition. For eight months he exercised his troops daily, when news was brought him that Machanidas was advancing, at the head of a numerous army, to invade his country. He accordingly, taking the field, met the enemy in the territories of Mantinea, where a battle was fought, in which he completely routed the Lacedæmonians, and killed their leader with his own hand; this happened about A.A.C. 204. But what most of all raised the fame and reputation of Philopœmen was his joining the powerful state of Lacedæmon to the Achæan commonwealth; by which means the Achæans came to eclipse all the other states of Greece. This memorable event happened in the year 191. The Lacedæmonians, overjoyed to see themselves delivered from the oppressions they had long groaned under, ordered the palace and furniture of their tyrant Nabis to be sold; and the sum accruing thence, to the amount of 120 talents, to be presented to Philopœmen, as a token of their gratitude. On this occasion, so great was the opinion which the Spartans had of his disinterestedness, that no one could be found who would take upon him to offer the present, until Timolaus was compelled by a decree. The money however he rejected, declaring he would always be their friend without expense. About two years after this, the city of Messene withdrew itself from the Achæan eague. Philopœmen attacked them; but was wounded, fell from his horse, was taken prisoner, and poisoned by Dinocrates, the Messenian general, in his seventieth year, A. A. C. 183. Philopœmen drank the cup with pleasure, when he heard from the jailor that his countrymen were victors. The Achæans, to revenge his murder, marched up to Messene, where Dinocrates, to avoid their vengeance, killed himself. The rest concerned in his murder were sacrificed on his tomb, and annual sacrifices were held to his memory by the Megalopolitans. To the valor and prudence of Philopœmen Achaia owed her glory, which upon his death declined; whence Philopœmen was called the last of the Greeks, as Brutus was afterwards styled the last of the Romans.

PHILOPONUS (John), a learned grammarian and philologist of the seventh century, born in Alexandria. He was of so studious a disposition that he was styled the Lover of Labor. He published many of Aristotle's tracts, with learned commentaries.

PHILOS'OPHEME, *n. s.*
PHILOS'OPHER,
PHILOSOPH'IC, *adj.*
PHILOSOPH'ICAL,
PHILOSOPH'ICALLY, *adv.*
PHILOS'OPHISE, *v. a.*
PHILOS'OPHY, *n. s.*

Gr. φιλοσοφημα; Fr. *philosophe*; Lat. *philosophus*. Principle of reasoning; theorem: a philosopher is a man of profound research in natural or moral knowledge: philosophic and philosophical, belonging to, or skilled in philosophy; rational; wise; temperate; the adverb corresponding: to philosophise is to act or reason as a philosopher: philosophy, natural or moral knowledge; system of knowledge or reasoning; argumentation.

I had never read, heard, nor seen any thing, I had never any taste of *philosophy* nor inward feeling in myself, which for a while I did not call to my succour. *Sidney.*

Many sound in belief have been also great *philosophers.* *Hooker.*

A drunkard is a good *philosopher*; for he thinks aright; the world goes round. *Overbury.*

We have our *philosophical* persons to make modern and familiar things supernatural and causeless. *Shakspeare.*

Hang up *philosophy*;
Unless *philosophy* can make a Juliet,
Displant a town, reverse a prince's doom,
It helps not. *Id.*

The progress you have made in *philosophy*, hath enabled you to benefit yourself with what I have written. *Digby.*

The *philosopher* hath long ago told us, that, accrding to the divers natures of things, so must the evidences for them be; and that 'tis an argument of an undisciplined wit not to acknowledge this. *Wilkins.*

That stone
Philosophers in vain so long have sought. *Milton*

Others in virtue placed felicity:
The stoick last in *philosophick* pride
By him called virtue; and his virtuous man,
Wise, perfect in himself, and all possessing. *Id.*
Of good and evil much they argued then,
Vain wisdom all and false *philosophy*. *Id.*

Qualities occult to Aristotle, must be so to us; and we must not *philosophise* beyond sympathy and antipathy. *Glanville.*

The law of commonweals that cut off the right hand of malefactors, if *philosophically* executed, is impartial; otherwise the amputation not equally punisheth all. *Browne.*

That part of chemistry, which is applied to the transmutation of metals, and the search of the *philosopher's-stone*, has enchanted, not to say turned the brains of many. *Temple.*

They all our famed *philosophers* defie,
And would our faith by force of reason try. *Dryden.*

This is what nature's wants may well suffice:
But, since among mankind so few there are
Who will conform to *philosophick* fare,
I'll mingle something of our times to please. *Id.*

No man has ever treated the passion of love with so much delicacy of thought and of expression, or searched into the nature of it more *philosophically* than Ovid. *Id.*

Some of our *philosophising* divines have too much exalted the faculties of our souls, when they have maintained that by their force mankind has been able to find out God. *Id.*

Two doctors of the schools were *philosophising* upon the advantages of mankind above all other creatures. *L'Estrange.*

If the *philosophers* by fire had been so wary in their observations and sincere in their reports, as those, who call themselves *philosophers*, ought to have been, our acquaintance with the bodies here about us had been yet much greater. *Locke.*

We shall in vain interpret their words by the notions of our *philosophy*, and the doctrines in our schools. *Id.*

Adam, in the state of innocence, came into the world a *philosopher*, which sufficiently appeared by his writing the natures of things upon their names; he could view essences in themselves, and read forms without the comment of their respective properties. *South.*

When the safety of the publick is endangered, the appearance of a *philosophical* or affected indolence must arise either from stupidity or perfidiousness. *Addison's Freeholder.*

How could our chymick friends go on
To find the *philosophick* stone? *Prior.*

His decisions are the judgment of his passions not of his reason, the *philosophy* of the sinner not of the man. *Rogers.*

Acquaintance with God is not a speculative knowledge, built on abstracted reasonings about his nature and essence, such as *philosophical* minds often busy themselves in, without reaping from thence any advantage towards regulating their passions, but practical knowledge. *Atterbury.*

If natural laws were once settled, they are never to be reversed; to violate and infringe them is the same as what we call miracle, and doth not sound very *philosophically* out of the mouth of an atheist. *Bentley's Sermons.*

You will learn how to address yourself to children for their benefit, and derive some usual *philosophemes* for your own entertainment. *Watts.*

What does *philosophy* impart to man
But undiscovered wonders? Let her soar
Even to her proudest heights; to where she caught
The soul of Newton and of Socrates,
She but extends her scope of wild amaze
And admiration. *K. White.*

The PHILOSOPHER'S STONE was the greatest object of alchemy, a long sought for preparation, which, when found, was expected to convert all the true mercurial part of metal into pure gold, better than any that is dug out of mines, or perfected by the refiner's art. Some Greek writers in the fourth and fifth centuries speak of this art as being then known; and towards the end of the thirteenth, when the learning of the east had been brought hither by the Arabians, the same pretensions began to spread through Europe. See ALCHEMY, CHEMISTRY, and TRANSMUTATION. Alchemists attempted to arrive at the making of gold by three methods: the first by separation; for every metal known, it was affirmed, contains some quantity of gold; only, in most, the quantity is so little as not to defray the expense of getting it out. The second by maturation; for they thought mercury the base and matter of all metals; that quicksilver purged from all heterogeneous bodies would be much heavier, denser, and simpler, than the native quicksilver, &c.; and that by subtilising, purifying, and digesting it with much labor, it was possible to convert it into pure gold. The third method was by transmutation, or turning other metals into pure gold, by melting them in the fire, and casting a quantity of a certain preparation into the fused matter. That which was to work the desired change in the metals was called the philosopher's stone. This pretended secret was encouraged by four licenses, granted to different projectors during the reign of Henry VI., and in succeeding times was patronised all over Europe.

PHILOSOPHY.

PHILOSOPHY, Gr. φιλοσοφια, of φιλεω, to love, and σοφια, is thus stated by Cicero to owe its origin to the modesty of Pythagoras:—'Every one knows that among the Greeks there were seven eminent men, who have since been universally denominated the 'seven wise men' of Greece: that, at a still earlier period, Lycurgus, and, even in the heroic ages, Ulysses and Nestor, were called wise men; in short, that this appellation has, from the most ancient times, been given to those who have devoted themselves to the contemplation of nature. This title continued in use till the time of Pythagoras. It happened, while this great man was at Phlius, that Leon, the chief of the Phliusians, was exceedingly charmed with the ingenuity and eloquence with which he discoursed upon various topics, and asked him in what art he principally excelled; to which Pythagoras replied that he did not profess himself master of any art, but that he was a 'philosopher.' Leon, struck with the novelty of the term, asked Pythagoras who were philosophers, and in what they differed from other men? Pythagoras replied that, as in the public games, while some are contending for glory, and others are buying and selling in pursuit of gain, there is always a third class of persons, who attend merely as spectators; so, in human life, amidst the various characters of men, there is a select number of those who, despising all other pursuits, assiduously apply themselves to the study of nature, and the search after wisdom: these, added Pythagoras, are the persons whom I call philosophers.' Cicero Tuscul. Disp. I. v. c. 3.

Happy had it been for science and for mankind had this ambition to be considered 'searchers after wisdom' rather than 'wise men' been perpetuated: but those who adopted the new term soon evinced equal vanity with their predecessors; and, according to Quintilian, 'despising the occupation of the orator (no very decisive proof of folly, however), employed themselves in prescribing rules for the conduct of life, and insolently assumed the title of the *sole* professors of wisdom.' In its usual acceptation the term philosophy has been taken to denote a science, or collection of sciences, of which the universe is the object. Pythagoras has defined it as επιστημη των οντων, 'the knowledge of things existing:' Cicero, after Plato, 'scientia rerum divinarum et humanarum cum causis;' and Bacon, 'interpretatio naturæ.' M. Chauvin, deriving the word from φιλια, desire or study, and σοφια, understands it to mean the desire or study of wisdom; for, says he, 'Pythagoras, conceiving that the application of the human mind ought rather to be called study than science, set aside the appellation of wise as too assuming.' Whether any of these definitions be sufficiently precise, and at the same time sufficiently comprehensive, may be questioned; but if philosophy, in its utmost extent, be capable of being adequately defined, it is not here that the definition would be given. 'Explanation,' says an acute writer, 'is the first office of a teacher; definition, if it be good, is the last of the enquirer after truth; but explanation is one thing, and definition quite another.'

The principal objects of philosophy, taken in its most general sense, are God, nature, and man. That part of it which treats of God is called theology; that which treats of nature physics and metaphysics; and that which treats of man logic and ethics.

An ingenious contemporary says, 'By philosophy we mean the knowledge of the reasons of things, in opposition to history, which is the bare knowledge of facts: or to mathematics, which is the knowledge of the quantity of things or their measures; and well observes,

'These three kinds of knowledge ought to be joined together as much as possible. History furnishes matter, principles, and practical examinations, and mathematics complete the evidence. Philosophy being the knowledge of the reason of things, all arts must have their peculiar philosophy, which constitutes their theory: not only law and physic, but the lowest and most abject arts are not destitute of their reasons, which might usefully employ the time of the studious; and the advantages resulting from this kind of employment have been amply manifested in the discoveries of modern times. One great obstacle to the progress of arts and sciences has been the neglect of practice in speculative men, and the ignorance and contempt of theory in mere practical men. What chimeras and absurdities the neglect of experience and practice has produced need not be mentioned; the mischiefs arising from a neglected theory are not so obvious; yet certainly it retards the progress of arts. All invention or improvement must be either casual or rational, including analogy or inference from similar cases, under the term rational. Now, although the foundations of arts have often been owing to some casual discovery, as gunpowder, or the loadstone, yet is this not to be trusted to alone. Improvements do not always flow from this source, but rather from the reflections of artists; and if these reflections were rendered more distinct, more communicable, and easier to be retained, by the proper use of signs and other philosophical helps, great advantages might be expected: it being certain that philosophical knowledge is more extensive, and more sure in the application; and besides gives a pleasure to the mind not to be expected from that which is merely historical. The bare intelligence and memory of philosophical propositions, without any ability to demonstrate them, is not philosophy, but history only. However, where such propositions are determinate and true, they may be usefully applied in practice, even by those who are ignorant of their demonstrations. Of this we see daily instances in the rules of arithmetic, practical geometry, and navigation; the reasons of which are often not understood by those who practise them with success. And this success in the application produces a conviction of mind, which is a kind of medium between philosophical, or scientifical, and historical knowledge.'

We are of opinion that this is a term of such immensely wide and general import as to be capable of little satisfactory treatment in a compendium of science. Our aim has been to treat fully and philosophically of each of the great branches of human knowledge, as they successively present themselves in our alphabet; not neglecting that of the science of mind itself; or the best account we could obtain of the speculations of our ablest predecessors on the nature and operations of human thought. See the articles LOGIC and METAPHYSICS. Nor have we neglected to present the reader with the substance of the most important doctrines of ancient and modern times on the subjects ordinarily embraced under the term ETHICS, or MORAL PHILOSOPHY. See the last of these articles. We refer also to the article THEOLOGY, as suggesting the leading points and influences in which all true mental and moral philosophy will terminate. The article PHYSICS, in this volume, will display [illegible] almost every other principal branch of philosophy, taken in its widest sense. This paper [illegible] be occupied chiefly with an historical sketch [illegible] certain principal philosophical systems; and [illegible] the claims of experimental philosophy.

SECT. I.—ANCIENT AND EXPLODED SYSTEMS.

Of the *Chaldean* philosophy much has [illegible] said, but very little is known. Astronomy seems to have been their favorite study; and notwithstanding their extravagant assertions of the antiquity of that science, which they pretend their ancestors had continued through a period of 470,000 years, Callisthenes, upon the most minute enquiry, which he made at the desire of Aristotle, found that their observations reached no farther back than 1903 years, or A. A. C. [illegible] Even this is a more early period than Ptolemy allows their science; for he mentions no Chaldean observations prior to the era of Nabonassor, or 747 years before Christ. That they cultivated something which they called philosophy, at a much earlier period than this, cannot be questioned; for Aristotle, on the credit of [illegible] most ancient records, speaks of the Chaldean magi as prior to the Egyptian priests, who were certainly men of learning, before the [illegible] of Moses. For any other science than [illegible] the stars we do not read that the Chaldeans were famous; and this seems to have been cultivated by them chiefly as the foundation of judicial astrology. If any credit be due to Plutarch and Vitruvius, who quote Berosus (see BEROSUS), [illegible] was the opinion of the Chaldean wise men that an eclipse of the moon happens when that part of its body which is destitute of fire is turned towards the earth. Their cosmogony, as given by Berosus, and preserved by Syncellus, seems to be this, that all things in the beginning consisted of darkness and water; that a divine power, dividing this humid mass, formed the world; and that the human mind is an emanation from the Divine nature.

The claim of the *Egyptians* to an early knowledge of nature is certainly well-founded; but as their science was the immediate source of that of the Greeks, we shall defer our notice of it for the present, and turn our attention to the Indian philosophy, as it was cultivated from a very early period by the brachmans and gymnosophists. We pass over Persia, because we know of no science peculiar to that kingdom, except the doctrines of the magi, which were religious rather than philosophical; and of them the reader will find an account under the words MAGI, POLYTHEISM, and ZOROASTER.

We are certain that the *Indian* philosophers from whatever quarter they received their philosophy, were held in high repute at a period of very remote antiquity, since they were visited by Pythagoras and other sages of ancient Greece. Yet they seem to have been in that early age, as well as at present, more distinguished for the severity of their manners than for the acquisition of science. The philosophy of the Indians has indeed from the beginning been engrafted on their religious dogmas, and seems to be a compound of extravagant metaphysics and superstition, with a very slight mixture of the knowledge of nature. The pundits of Hindostan allow no powers whatever to matter, but introduce the Supreme Being as the immediate cause of every effect, however trivial. 'Brehm, the spirit of God,' says one of their most revered authorities, 'is absorbed in self-contemplation. The same is the mighty Lord, who is present in every part of space, whose omnipresence, as expressed in the Reig-Beid, or Rigveda, I shall now explain. Brehm is one, and to him there is no second; such is truly Brehm. His omniscience is self-inspired or self-intelligent, and its comprehension includes every possible species. To illustrate this as far as I am able; the most comprehensive of all comprehensive faculties is omniscience: and, being self-inspired, it is subject to none of the accidents of mortality, conception, birth, growth, decay, or death; neither is it subject to passion or vice. To it the three distinctions of time, past, present, and future, are not. To it the three modes of being are not (to be awake, to sleep, and to be unconscious). It is separated from the universe, and independent of all. This omniscience is named Brehm. By this omniscient spirit the operations of God are enlivened. By this Spirit also the twenty-four powers of nature are animated. How is this? As the eye by the sun, as the pot by the fire, as iron by the magnet, as variety of imitations by the mimic, as fire by the fuel, as the shadow by the man, as dust by the wind, as the arrow by the spring of the bow, and as the shade by the tree; so by this Spirit the world is endued with the powers of intellect, the powers of the will, and the powers of action: so that if it emanates from the heart by the channel of the ear, it causes the perception of sounds; if it emanates from the heart by the channel of the skin, it causes the perception of touch; if it emanates from the heart by the channel of the eye, it causes the perception of visible objects; if it emanates from the heart by the channel of the tongue, it causes the perception of taste; if it emanates from the heart by the channel of the nose, it causes the perception of smell. This also invigorating the five members of action, the five members of perception, the five elements, the five senses, and the three dispositions of the mind, &c., causes the creation or the annihilation of the universe, while itself beholds every thing as an indifferent spectator.' From this quotation, it is plain that all the motions in the universe, and all the perceptions of man, are, according to the brahmins, caused by the immediate agency of the Spirit of God, which seems to be here considered as the soul of the world. And it appears from some papers in the Asiatic Researches, that the most profound of these Oriental philosophers, and even the authors of their sacred books, believe not in the existence of matter as a separate substance. Sir W. Jones says they hold an opinion respecting it similar to that of the celebrated Berkeley.

We have shown elsewhere that the metaphysical doctrines of the brahmins respecting the human soul differ not from those of Pythagoras and Plato; and that they believe it to be an emanation from the great soul of the world, which, after many transmigrations, will be finally absorbed in its parent substance. From the brahmins believing in the soul of the world, not only as the agent, but as the immediate cause of every motion in nature, we can hardly suppose them to have made any great progress in that science which in Europe is cultivated under the name of physics. They have no inducement to investigate the laws of nature; because, according to the first principles of their philosophy, which, together with their religion, they believe to have been revealed from heaven, every phenomenon, however regular, or however anomalous, is produced by the voluntary act of an intelligent mind. Yet in astronomy, geometry, and chronology, they appear to have made some proficiency at a very early period (see ASTRONOMY, Index). Their chronology and astronomy are indeed full of those extravagant fictions; but their calculations of eclipses, and their computations of time, are conducted upon scientific principles. 'They suppose,' says Mr. Halhed, 'that there are fourteen spheres, seven below and six above the earth. The seven inferior worlds are said to be altogether inhabited by an infinite variety of serpents, described in every monstrous figure that the imagination can suggest. The first sphere above the earth is the immediate vault of the visible heavens, in which the sun, moon, and stars are placed. The second is the first paradise and general receptacle of those who merit a removal from the lower earth. The third and fourth are inhabited by the souls of those men who, by the practice of virtue and dint of prayer, have acquired an extraordinary degree of sanctity. The fifth is the reward of those who have all their lives performed some wonderful act of penance and mortification, or who have died martyrs for their religion. The highest sphere is the residence of Brahma and his particular favorites, such as those men who have never uttered a falsehood during their whole lives, and those women who have voluntarily burned themselves with their husbands. All these are absorbed in the divine essence.' On ethics, the Hindoos have nothing that can be called philosophy. Their duties, moral, civil, and religious, are all laid down in their Vedas and Shasters, and enjoined by what they believe to be divine authority; which supersedes all reasoning concerning their fitness or utility.

Respecting the ancient philosophy of the *Arabians* and *Chinese*, the narrow limits of such an abstract as this hardly admit of our mentioning the conjectures of the learned. There is indeed sufficient evidence that both nations were, at a very early period, observers of the stars; and that the Chinese had even a theory by which they foretold eclipses; but there is reason to believe that the Arabians, like other people in their circumstances, were little more than judicial astrologers. Pliny makes mention of their magi, whilst later writers tell us that they were famous for their ingenuity in solving enigmatical questions, and for their skill in the arts of divination: but the authors of Greece are silent concerning their philosophy; and there is no work of greater antiquity than the Koran extant among them.

We pass, therefore, to the *Phœnicians*, whose commercial celebrity has induced many learned men to allow them great credit for early science. If it be true indeed, as it seems probable, that the ships of this nation had doubled the Cape of Good Hope, and almost encompassed the peninsula of Africa long before the era of Solomon, we cannot doubt that the Phœnicians had made great proficiency in navigation and astronomy, at a very remote period. Nor were these the only sciences cultivated by that ancient people: Moschus or Mochus, a Phœnician, who, according to Strabo, flourished before the Trojan war, was the author of the atomic philosophy, afterwards adopted by Leucippus, Democritus, and others among the Greeks; and it was with some of the successors of this sage that Pythagoras, as Jamblicus tells us, conversed at Sidon, and from them received his doctrine of Monads. Another proof of the early progress of the Phœnicians in philosophy may be found in the fragments of their historian Sanchoniatho, which have been preserved by Eusebius. This ancient writer teaches that, according to the wise men of his country, all things arose at first from the necessary agency of an active principle, upon a passive chao ic mass, which he calls 'mot.' This chaos, Cudworth thinks, was the same with the elementary water of Thales, who was also of Phœnician extraction; but Mosheim justly observes, that it was rather dark air, since Philo translates it αερα ζορωδη. Besides Mochus and Sanchoniatho, Cadmus, who introduced letters into Greece, may undoubtedly be reckoned a philosopher. Several other Phœnician philosophers are mentioned by Strabo; but as they flourished at a later period, and philosophised after the systematic mode of the Greeks, they fall not properly under our notice. We pass on therefore to the philosophy of Egypt.

The *Greeks* confess that all their learning was derived from the Egyptians, either imported immediately by their own philosophers, or brought through Phœnicia by the sages of the east; and we know from higher authority that, at a period so remote as the birth of Moses, 'the wisdom of the Egyptians was famous.' Yet the history of Egyptian learning and philosophy, though men of the first eminence, both ancient and modern, have bestowed much pains in attempts to elucidate it, still remains involved in clouds of doubt and hieroglyphics. That they had some knowledge of physiology, arithmetic, geometry, and astronomy, are facts which cannot be questioned; but there is reason to believe that even these sciences were in Egypt pushed no farther than to the uses of life. That they believed in the existence of incorporeal substances is certain; because Herodotus assures us that they were the first asserters of the immortality, pre-existence, and transmigration of human souls, which they could not have been without believing the soul to be at least incorporeal, if not immaterial. Plato says that Thoth, Theut, or Taaut, called by the Greeks Hermes, and by the Romans Mercury, was the inventor of letters; and, lest we should suppose that by those letters nothing more is meant than picture writing or symbolical hieroglyphics, it is added, that he distinguished between vowels and consonants, determining the number of each. The same philosopher attributes to Thoth the invention of arithmetic, geometry, astronomy, and hieroglyphic learning. The art of alchymy also has been said to have been professed by the ancient Egyptians; and from Hermes, their celebrated philosopher, it has been called the Hermetic art.

When the intercourse between the Egyptians and Greeks first commenced, the wisdom of the former people consisted chiefly in the science of legislation and civil policy, and the philosopher, the divine, the legislator, and the poet, were united in the same person. Their cosmogony differed little from that of the Phœnicians. They held that the world was produced from chaos by the energy of an intelligent principle; and they likewise conceived that there is in nature a continual tendency towards dissolution. In Plato's Timæus, an Egyptian priest is introduced describing the destruction of the world, and asserting that it will be effected by means of water and fire. They conceived that the universe undergoes a periodical conflagration; after which all things are restored to their original form, to pass again through a similar succession of changes.

'Of preceptive doctrine' says Dr. Enfield, in his History of Philosophy, 'the Egyptians had two kinds, the one sacred, the other vulgar. The former, which respected the ceremonies of religion and the duties of the priests, was doubtless written in the sacred books of Hermes, but was too carefully concealed to pass down to posterity. The latter consisted of maxims and rules of virtue, prudence, or policy. It is in vain to look for accurate principles of ethics among an ignorant and superstitious people. And that the ancient Egyptians merited this character is evident from this single circumstance, that they suffered themselves to be deceived by impostors, particularly by the professors of the fanciful art of astrology.'

Phoroneus, Cecrops, Cadmus, and Orpheus, were among the earliest instructors of the Greeks; and they inculcated Egyptian and Phœnician doctrines in detached maxims, and enforced them, not by strength of argument, but by the authority of tradition. Their cosmogonies were wholly Phœnician or Egyptian, disguised under Grecian names; and they taught a future state of rewards and punishments. The planets and the moon, Orpheus conceived to be habitable worlds, and the stars to be fiery bodies like the sun: but he taught that they are all animated by divinities; an opinion which prevailed both in Egypt and the east: and it does not appear that he gave any other proof of his doctrines, than a confident assertion that they were derived from some god. Among the Greeks, an ingenious and penetrating people, philosophy soon assumed the form of profound speculation. Two eminent philosophers arose nearly at the same period, who may be considered as the parents not only of Grecian science, but of almost all the science cultivated in Europe, prior to the era of lord Bacon: these were Thales and Pythagoras; of whom the former founded the Ionic school, and the latter the Italic: from which two sprung the various sects into which the Greek philosophers were afterwards divided. A bare enumeration of these sects is all that our limits will afford; and we shall give it in the perspicuous language of Dr. Enfield, referring our readers for a fuller account than we can give of their respective merits to his translation of Brucker's history.

I. 'Of the Ionic school were, 1. The Ionic sect proper, whose founder Thales had as his successors Anaximenes, Anaxagoras, Diogenes, Apolloniates, and Archelaus. 2. The Socratic school, founded by Socrates, the principal of whose disciples were Xenophon, Æschines, Cimon, Cebes, Aristippus, Phædo, Euclid, Plato, Antisthenes, Critias, and Alcibiades. 3. The Cyrenaic sect, of which Aristippus was the author; his followers were, his daughter Arete, Hegesias, Aniceris, Theodorus, and Bion. 4. The Megaric or Eristic sect, formed by Euclid of Megara: to whom succeeded Eubulides, Diodorus, and Stilpo, famous for their logical subtlety. 5. The Eliac or Eretriac school, raised by Phædo of Elis, who, though he closely adhered to the doctrine of Socrates, gave name to his school. His successors were Plistanus and Menedemus; the latter of whom, being a native of Eretria, transferred the school and name to his own country. 6. The Academic sect, of which Plato was the founder. After his death, many of his disciples deviating from his doctrine, the school was divided into the old, new, and middle academies. 7. The Peripatetic sect, founded by Aristotle, whose successors in the Lyceum were Theophrastus, Strabo, Lycon, Aristo, Critolaus, and Diodorus. Among the Peripatetics, besides those who occupied the chair, were also Dicæarchus, Eudemus, and Demetrius Phalereus. 8. The Cynic sect, of which the author was Antisthenes, whom Diogenes, Onesicritus, Crates, Metrocles, Menippus, and Menedemus, succeeded. In the list of Cynic philosophers must also be reckoned Hipparchis, the wife of Crates. 9. The Stoic sect, of which Zeno was the founder. His successors in the porch were Persæus, Aristo of Chios, Herillus, Sphærus, Cleanthes, Chrysippus, Zeno of Tarsus, Diogenes the Babylonian, Antipater, Panætius, and Posidonius.

II. 'Of the Italic school were, 1. The Italic sect proper: it was founded by Pythagoras, a disciple of Pherecydes. The followers of Pythagoras were Aristæus, Mnesarchus, Alcmæon, Ecphantus, Hippo, Empedocles, Epicharmus, Ocellus, Timæus, Archytas, Hippasus, Philolaus, and Eudoxus. 2. The Eleatic sect, of which Xenophanes was the author: his successors, Parmenides, Melissus, Zeno, belonged to the metaphysical class of this sect; Leucippus, Democritus, Protagoras, Diagoras, and Anaxarchus, to the physical. 3. The Heraclitean sect, which was founded by Heraclitus, and soon afterwards expired: Zeno and Hippocrates philosophised after the manner of Heraclitus, and other philosophers borrowed freely from this system. 4. The Epicurean sect, a branch of the Eleatic, had Epicurus for its author; among whose followers were Metrodorus, Polyænus, Hermachus, Polystratus, Basilides, and Protarchus. 5. The Pyrrhonic or Sceptic sect, the parent of which was Pyrrho; his doctrine was taught by Timon the Phliasian; and after some interval was continued by Ptolemy, a Cyrenean, and at Alexandria by Ænesidemus.' Of the peculiar doctrines of these sects, the reader will in this work find a short account, either in the lives of their respective founders, or under the names of the sects themselves.

All the systematic philosophers pursued their inquiries into nature by nearly the same method. They established certain definite arrangements or classes, to some of which every thing past, present, or to come, might be referred; and having ascertained, as they thought, all that could be affirmed or denied of these classes, they proved, by a short process of syllogistic reasoning, that what is true of the class must be true of every individual comprehended under it. The most celebrated of these arrangements is that which is known by the name of categories; which Mr. Harris thinks at least as old as the era of Pythagoras. These categories are, *substance*, *quality*, *quantity*, *relation*, *action*, *passion*, *when*, *where*, *position*, and *habit*; which, according to the systematic philosophy of the Greeks comprehend every human science and every subject of human thought. 'History, natural and civil, springs,' says Mr. Harris, 'out of substance; mathematics out of quantity; optics out of quality and quantity; medicine out of the same; astronomy out of quantity and motion; music and mechanics out of the same; painting out of quality and site; ethics out of relation; chronology out of when (or time); geography out of where (or place); electricity, magnetism, and attraction, out of action and passion; and so in other instances.

'This mode of philophising spread from Greece over the whole civilised world. It was carried by Alexander into Asia, by his successors into Egypt; and it found its way to Rome after the conquest of Greece. It was adopted by the Jews, by the Christian fathers, by the Mahometan Arabs during the caliphate, and by the schoolmen through all Europe, till its futility was exposed by lord Bacon. Its professors often displayed great acuteness; but their systems were built on mere hypotheses, and supported by syllogistic wrangling. Now and then indeed a superior genius, such as Alhazen and our countryman Roger Bacon, broke through the trammels of the schools, and, regardless of the authority of the Stagyrite, made real discoveries in physical science, by experiments judiciously conducted on individual substances; but the science in repute still continued to be that of Generals.'

From the eighth to the fourteenth century of the Christian era, the whole circle of instruction, or the liberal arts, as they were called, consisted of two branches, the trivium and the quadrivium; of which the former comprehended grammar, rhetoric, and dialectics; the latter music, arithmetic, geometry, and astronomy, to which was added, about the end of the eleventh century, the study of a number of metaphysical subtleties equally useless and unintelligible. The works of the ancient Greek philosophers had been hitherto read only in imperfect Latin translations; and, before the scholastic system was completely established, Plato and Aristotle had been alternately looked up to as oracles in science. The rigid schoolmen, however, universally gave the preference to Aristotle; because his analysis of body into matter and form is peculiarly calculated to keep in countenance that most incredible doctrine of the Romish church (transubstantiation); and, upon the revival of Greek learning, this preference was continued after the school philosophy had begun to fall into contempt.

At last Luther and his associates set the minds of men free from the tyranny of ancient names, both in science and theology; and many philosophers sprung up in different countries of Europe, who professed to study nature, regardless of every authority but that of reason. Of these the most eminent beyond all comparison was Francis Bacon, lord Verulam. This illustrious man, having read with attention the writings of the most celebrated ancients, and made himself master of the sciences which were then cultivated, soon discovered the absurdity of pretending to account for the phenomena of nature by syllogistic reasoning from hypothetical principles; and, with a boldness becoming a genius of the first order, undertook to give a new chart of human knowledge. This he did in his two admirable works, entitled 1. De Dignitate et Augmentis Scientiarum; and 2. Novum Organum Scientiarum, sive Judicia vera de Interpretatione Naturæ. In the former of these works he takes a very minute survey of the whole circle of human science, which he divides into three great branches, history, poetry, and philosophy, corresponding to the three faculties of the mind, memory, imagination, and reason. Each of these general heads is subdivided into minuter branches, and reflections are made upon the whole, though we can neither copy nor abridge here. The purpose of the Novum Organum is to point out the proper method of interpreting nature; which the author shows can never be done by the logic which was then in fashion, but only by a painful and fair induction. This great man was no less an enemy to hypotheses and preconceived opinions, which he calls idola theatri, than to syllogisms; and since his days almost every philosopher of eminence, except Descartes and his followers (see CARTES), has professed to study nature according to the method so accurately laid down in the Novum Organum. Of this mode of philosophising we shall now give a short but accurate view, by stating its objects, comparing it with that which it superseded, explaining its rules, and pointing out its uses.

SECT. II.—VIEW OF LORD BACON'S PHILOSOPHY.

That unbounded object of the contemplation, curiosity, and researches of man, the universe, may be considered in various important points of view. It may be considered merely as a collection of existences, related to each other by means of resemblances and distinctions; situation, succession, and derivation, as making parts of a whole. In this view it is the subject of pure description: and, in order to acquire a knowledge of the universe in this point of view, we must enumerate all the beings in it, mention their sensible qualities, and mark all the relations for each. But this would be labor immense, and, when done, an undistinguishable chaos. A book containing every word of a language would only give us the materials of this language. To make it comprehensible, it must be put into some form, which will comprehend the whole in a small compass, and enable the mind to pass easily from one word to another. Of relations among words, the most obvious are those of resemblance and derivation. An etymological dictionary, therefore, in which words are classed in consequence of their resemblance, and arranged by means of their derivative distinctions, will greatly facilitate the acquisition of the language.

Thus, too, the objects of nature around us may be classed according to their resemblance, and then arranged in those classes by particular distinctions. In this classification we proceed by our faculty of abstracting our attention from the circumstances in which things differ, and turning it to those only in which they agree. By this faculty we can not only distribute the individuals into classes, but also subdivide these classes into orders, genera, and species. That vast number of individuals resembling each other in the single circumstance of life, composes the most extensive kingdom of animals. If it be required that they shall further resemble in the circumstance of having feathers, a prodigious number of animals are excluded, and we form the inferior class of birds. We exclude a great number of birds by requiring a further similarity of web feet, and have the order of anseres. If we add lingua citiata, we confine attention to the genus of anates. In this manner may the whole objects of the universe be arranged, divided, and subdivided, into kingdoms, classes, orders, genera, and species.

This classification and arrangement is called natural history, and is the only foundation of any extensive knowledge of nature. To the natural historian, therefore, the world is a collection of existences, the subject of description and arrangement. His aim is threefold: 1. To observe with care, and describe with accuracy, the various objects of the universe. 2. To determine and enumerate all the great classes of objects; to distribute and arrange them into all their subordinate classes, through all degrees of subordination, till he arrive at what are only accidental varieties, which are susceptible of no further distribution; and to mark with precision the principles of this distribution and arrangement, and the characteristics of the various assemblages. 3. To determine with certainty the particular group to which any proposed individual belongs.

Description, therefore, arrangement, and reference, constitute the whole of his employment; and in this consists all his science.

Were the universe to continue unchanged, this would constitute the whole of our knowledge of nature; but we are witnesses of an uninterrupted succession of changes, and our attention is continually called to the *events* which are incessantly happening around us. These form a set of objects vastly more interesting to us than the former; being the sources of almost all the pleasures or pains we receive from external objects. The study of the events which happen around us becomes highly interesting, and we are strongly incited to prosecute it; but they are so numerous and so multifarious that the labor would be immense, without some contrivance for abbreviating and facilitating it. The same help offers itself here as in the study of what may be called quiescent nature. Events, like existences, are susceptible of classification, in consequence of resemblances and distinction; and, by attention to these, we can acquire a very extensive acquaintance with active nature. Our attention must be chiefly directed to those circumstances in which many events resemble each other, while they differ perhaps in a thousand others. Then we must attend to their most general distinctions, then to distinctions of smaller extent, and so on. In this way, accordingly, we have advanced in our knowledge of active nature, and are gradually and by no means slowly, forming assemblages of events more and more extensive, and distributing these with greater and greater precision into their different classes.

In describing those circumstances of similarity among events, and in distributing them according to those similarities, it is impossible to overlook that constancy which is observed in the changes of nature, in the events which are the objects of our contemplation. Events which have once been observed to accompany each other are observed always to do so. The rising of the sun is always accompanied by the light of day, and his setting by the darkness of night. Sound argument is accompanied by conviction, impulse by motion, kindness by a feeling of gratitude, and the perception of good by desire. The uniform experience of mankind informs us that the events of nature go on in certain regular trains; and, if sometimes exceptions seem to contradict this general affirmation, more attentive observation never fails to remove the exception. Most of the spontaneous events of nature are very complicated; and it frequently requires great attention and penetration to discover the simple event amidst a crowd of unessential circumstances which are at once exhibited to our view. But, when we succeed in this discovery, we never fail to acknowledge the perfect uniformity of the event to what has been formerly observed. Hence we firmly believe that this uniformity will still continue; that fire will melt wax, will burn paper, will harden clay, as we have formerly observed it to do; and whenever we have undoubted proofs that the circumstances and situation are precisely the same as in some former case, though but once observed, we expect with confidence that the event will also be the same.

Many proofs of the universality of this law of human thought are not necessary. The whole language and actions of men are instances of the fact. In all languages there is a mode of construction used to express this relation as distinct from all others, and the conversation of the most illiterate never confounds them. The general employment of the active and passive verb is regulated by it. 'The tower was demolished by the soldiers; the town was overthrown by an earthquake;' are sentences that express two relations, and no school-boy will mistake them. The distinction therefore is perceived or felt by all. Nor is any language without general terms to express this relation, cause and effect. Nay, even brutes show that they expect the same uses of every subject which they formerly made of it; and, without this, animals would be incapable of subsistence, and man incapable of all improvement. From this alone memory derives all its value; and even the constancy or natural operation would be useless, if not matched or adapted to our purposes by this expectation of and confidence in that constancy.

The result of all the enquiries of ingenious men, to discover the foundation of this irresistible expectation, is, 'such is the constitution of the human mind.' It is a universal fact in human thought; and it appears to be an ultimate fact, not included in any other still more general. This is sufficient for making it the foundation of true human knowledge; all of which must in like manner be reduced to ultimate facts in the human thought.

This persuasion of the constancy of nature we must consider as an *instinctive* anticipation of events similar to those which we have already experienced. The general analogy of nature should have disposed philosophers to acquiesce in this. In no instance of importance to our safety or well-being are we left to the guidance of our boasted reason; God has given us the surer conduct of natural instincts. No case is so important as this; in none do we so much stand in need of a guide, which shall be powerful, infallible, and rapid in its decisions. Without it we should remain incapable of all instruction from experience, and therefore of all improvement.

Our sensations are no doubt feelings of our mind. But those feelings are accompanied by an instinctive reference to something distinct from the feelings themselves. Hence arise our perceptions of external objects, and our very notions of this externeity, if we may use the term. In like manner, this anticipation of events, this irresistible connexion of the idea of fire with the idea of burning, is also a feeling of the mind; and this feeling is by a law of human nature referred, without reasoning, to something external as its cause; and, like our sensation, it is considered as a sign of that external something. It is like the connexion of the truth of a mathematical proposition. The conviction is the sign or indication of this relation by which it is brought to our view. In the same manner, the irresistible connexion of ideas is interpreted as the sensation or sign of a necessary connexion of external things or events. These are supposed to include something in their nature which renders them inseparable companions. To this bond of connexion between external things we give the name of causation. All our knowledge of this relation of cause and effect is the knowledge o consciousness of what passes in our own minds, during the contemplation of the phenomena of nature. If we adhere to this view of it, and put this branch of knowledge on the same footing with those called the abstract sciences, considering only the relations of ideas, we shall acquire demonstrative science. Any other view of the matter will lead us into inextricable mazes of uncertainty and error.

We thus, then, perceive that the natural procedure of our faculty of abstraction and arrangements in order to acquire a more speedy and comprehensive knowledge of natural events, presents them to our view in another form. We not only see them as similar events, but as events naturally and necessarily conjoined. And the expression of resemblance among events is also an expression of concomitancy; and this arrangement of events in consequence of their resemblance is in fact the discovery of those accompaniments. The trains of natural appearance being considered as the appointments of the Author of Nature, has occasioned them to be considered also as consequences of laws imposed on his works by their great Author, and every thing is said to be regulated by fixed laws.

There is a great resemblance between the expression natural law, and grammatical rule. Rule in grammar expresses merely a generality of fact, whether of flexion or construction. In like manner, a law of nature is to the philosopher nothing, but the expression of a generality of fact. A natural or physical law is a generally observed fact; and, whenever we treat any subject as a generally observed fact, we treat it physically. It is a physical law of the understanding, that argument is accompanied by conviction; it is a physical law of the affection that distress is accompanied by pity; it is a physical law of the material world that impulse is accompanied by motion. And thus we see that the arrangement of events, or the discovery of those general points of resemblance, is in fact the discovery of the laws of nature; and one of the greatest and most important is, that the laws of nature are constant. This view of the universe is incomparably more interesting and important than that which is taken by the natural historian; contemplating every thing that is of value to us, and, in short, the whole life and movement of the universe. This study, therefore, has been dignified with the name of philosophy and of science; and natural history has been considered as of importance only in so far as it is conducive to the successful prosecution of philosophy.

The philosopher claims a superiority on another account: he considers himself as employed in the discovery of causes, and that it is by the discovery of these relations that he communicates to the world such important knowledge. Philosophy, he says, is the science of causes. The vulgar are contented to consider the prior of two inseparably conjoined events as the cause of the other; the stroke on a bell, for instance, as the cause of sound. But it has been clearly discovered by the philosopher that between the blow on the bell and the sensation of sound, there are interposed a long train of events. The blow sets the bell a trembling; this agitates the air in contact with the bell; that the air immediately beyond it; and thus between the bell and the ear may be interposed a numberless series of events, and as many more between the first impression on the ear and that last impression on the nerve by which the mind is affected. He can no longer therefore follow the nomenclature of the vulgar. Which of the events of this train therefore is the cause of the sensation? None of them: It is that something, which inseparably connects any two of them, and constitutes their bond of union. These causes he considers as residing in one or both of the connected objects: diversities in this respect must therefore constitute the most important distinctions between them. They are therefore with great propriety called the qualities, the properties, of these respective subjects. As the events, from which we infer the existence of these qualities of things, resemble in many respects such events as are the consequences of the exertion of our own powers, these qualities are frequently denominated powers, forces, energies. Thus, from the instance of the sound of a bell, we infer the powers of impulse, elasticity, nervous irritability, and animal sensibility.

From this necessary connexion between the objects around us we not only infer the posterior event from the prior, or, in common language, the effect from the cause, but we also infer the prior from the posterior, the cause from the effect. We not only expect that the presence of a magnet will be followed by certain motions in iron filings, but, when we observe such motions, we infer the presence and agency of a magnet. Joy is inferred from merriment, poison from sudden or unaccountable death, fire from smoke, and impulse from motion. And thus the appearances of the universe are the indications of the powers of the objects in it. As all our knowledge of the sentiments of others is derived from our confidence in their veracity; so all our knowledge of nature is derived from our confidence in the constancy of her operations. A credulity in our neighbour's veracity, resulting from that law of our mental constitution by which we speak, conducts us in the one case; and the constancy of nature, by which we infer general laws from particular facts, conducts us in the other. It is by the successful study of this language of nature that we derive useful knowledge. The knowledge of the influence of motives on the mind of man enables the statesman to govern kingdoms, and the knowledge of the powers of magnetism enables the mariner to pilot a ship through the pathless ocean.

Such are the high pretensions of philosophy. It is to be wished that they be well founded; for we may be persuaded that a mistake in this particular will be fatal to the advancement of knowledge. An author of great reputation gives us an opportunity of deciding this question in the way of experiment. He says that the ancients were philosophers, employed in the discovery of causes, and that the moderns are only natural historians, contenting themselves with observing the laws of nature, but paying no attention to the causes of things. If he speaks of their professed aim, we apprehend that the assertion is pretty just in general. With very few exceptions, indeed, it may be affirmed of his favorite Aristotle, the philosopher κατ' ἐξοχην, and of Sir Isaac Newton. We select these two instances, both because they are set in continual opposition by this author, and because it will be allowed that they were the most eminent students of nature (for we must not call them philosophers), in ancient and modern times.

Aristotle's professed aim, in his most celebrated writings, is the investigation of causes; and, in the opinion of this author, he has been so successful that he has hardly left any employment for his successors beside that of commenting upon his works. We must, on the other hand, acknowledge that Newton makes no such pretensions, at least in that work which has immortalised his name, and that his professed aim is merely to investigate the general laws of the planetary motions, and to apply these to the explanation of particular phenomena. Nor will we say that he has left no employment for succeeding enquirers; but, on the contrary, confess that he has only begun the study, has discovered but one law, and has enabled us to explain only the phenomena comprehended in it. But his investigation has been complete: he has discovered, beyond all possibility of contradiction, a fact which is uniform through the whole extent of the solar system; namely, that every body, nay that every particle in it, is continually deflected towards every other body; and that this deflection is, in every instance, proportional to the quantity of matter in that body towards which the deflection is directed, and to the reciprocal of the square of the distance from it. He has therefore discovered a physical law of immense extent. Nor has he been less successful in the explanation of particular phenomena. Of this there cannot be given a better instance than the explanation of the lunar motions from the theory of gravity begun by Newton, Mathesi sua facem præferente; and now brought to such a degree of perfection, that if the moon's place be computed from it for any moment within the period of 2000 years back, it will not be found to differ from the place on which she was actually observed by the 100th part of her own breadth.

We may challenge the Aristotelians to name any one cause which has really been discovered by their great master, whether in the operations of mind or of body. They must not adduce the investigation of any natural law in which he has sometimes succeeded. With still greater confidence may we challenge them to produce any remarkable instance of the explanation of natural phenomena either of mind or body. By explanation, we mean an account of the production, and an appreciation of all the circumstances, susceptible of a scrupulous comparison with fact, and perfectly consistent with it. It is here that the weakness of this philosopher's hypothesis is most conspicuous; and his followers acknowledge, that, in the enquiries which proceed by experiment, they have not derived great assistance from Aristotle's philosophy. But this, say they, does not derogate from the pre-eminence of his philosophy, because he has shown that the particular fields of observation are to be cultivated only by means of experiment. But surely every field of observation is particular. There is no abstract object of philosophical research, the study of which shall terminate in the philosophy of universals. There is therefore great room for suspecting that Aristotle and his followers have not aimed at the discovery of causes, but only at the discovery of natural laws, and have failed in the attempt.

Into the previous question, Is it possible to discover a philosophical cause, that something which is neither the prior nor the posterior of the two immediately adjoining events, but their bond of union and this distinct from the union itself? we are not disposed to enter at length.

Much has been written on this subject. The most acute observation and sound judgment have been employed in the study: but, in all these researches, no phenomena have occurred which look like the perception or contemplation of a philosophical cause, or this power in abstracto. No philosopher has ever pretended to state such an object of the mind's observation. Those causes, those bonds of necessary union between the naturally conjoined events or objects, are not only perceived by means of the events alone, but are perceived solely in the events, and cannot be distinguished from the conjunctions themselves. They are neither the objects of separate observation, nor the productions of memory, nor inferences drawn from reflection on the laws by which the operations of our own minds are regulated; nor can they be derived from other perceptions in the way of argumentative inference. We cannot infer the paroxysm of terror from the appearance of impending destruction, nor the fall of a stone when not supported, as we infer the incommensurability of the diagonal and side of a square. This last is implied in the very conception or notion of a square; not as a consequence of its other properties, but as one of its essential attributes: and the contrary proposition is not only false, but incapable of being distinctly conceived. This is not the case with the other phenomenon, nor any matter of fact. The proofs which are brought of a mathematical proposition are not the reason of its being true, but the steps by which this truth is brought into our view; and frequently, as in the instance now given, this truth is perceived, not directly, but consequentially, by the inconceivableness of the contrary proposition.

Hume derives this irresistible expectation of events from the known effect of custom, and the association of ideas; an explanation which begs the very thing to be proved, when it ascribes to custom a power of any kind. Besides, on the genuine principles of scepticism, this custom involves an acknowledgment of past events, of a something different from present impressions, which, in this doctrine, are the only certain existences in nature.

Leibnitz and Malebranche deny that there is any such connexion, and assert that the events of the universe go on in corresponding trains, but without any causal connexion, just as a well regulated clock will keep time with the motions of the heavens without any kind of dependence on them; that this harmony of events was preestablished by the Author of the Universe, in subserviency to the purposes he had in view in its formation, &c. But, without insisting on the fantastic wildness of this ingenious whim, it is enough to observe that it also is a begging of the question, because it supposes causation when it ascribes all to the agency of the Deity.

That we do perceive the relation of causation as distinct from all others, and in particular as distinct from the relation of contiguity in time and place—or the relation of agent, action, and patient, must be concluded from the uniformity of language, which never confounds them except on purpose, and when it is perceived. But even here we shall find that none of the terms used for expressing those powers of substance, which are conceived as the causes of their characteristic phenomena, really express any thing different from the phenomena themselves. Let any person try to define the terms gravity, elasticity, sensibility, and the like, and he will find that the definition is nothing but a description of the phenomenon itself. The words are all derivatives, most of them verbal derivatives, implying action, gravitation, &c. As the general resemblances in shape, color, &c., are expressed by the natural historian by generic terms, so the general resemblances in event are expressed by the philosopher in generic propositions, which, in the progress of cultivation, are also abbreviated into generic terms. This abundantly explains the consistency of our language on this subject, both with itself, and with the operations of nature, without however affording any argument for the truth of the assumption, that causes are the objects of philosophic research as separate existences; or that this supposed necessary connexion is a necessary truth, whether supreme or subordinate. But since the perception of it has its foundation in the constitution of the human mind, it seems entitled to the name of a first principle. We are hardly allowed to doubt of this when we consider the importance of it, and the care of nature to secure us, in all things essential to our safety and well-being, from all danger, from inattention, ignorance, or indolence, by an instinct infallible in its information, and instantaneous in its decisions.

Causes, therefore, say some of our ablest writers on this subject, are no more cogniscible by our intellectual powers than colors by a man born blind: nay, whoever will be at the pains to consider this matter will find that necessary connexion, or bond of causation, can no more be the subject of philosophical discussion by man than the ultimate nature of truth. It is precisely the same absurdity or congruity as to propose to examine light with a microscope. All that we can say is that their existence is probable, but by no means certain. But all this is indifferent to the real occupation of the philosopher, and does not affect either the certainty, the extent, or the utility of the knowledge which he may acquire.

We are now able to appreciate the high pretensions of the philosophy of lord Bacon, and its claim to scientific superiority. The true object of the philosopher is not causes: his discoveries are nothing but the discovery of general facts and physical laws; and his employment is the same with that of the descriptive historian. He observes and describes with care and accuracy the events of nature; and then he groups them in classes, from resembling circumstances, detected in the midst of many others which are dissimilar and occasional. By gradually throwing out some circumstances of resemblance, he renders his classes more extensive; by carefully marking those circumstances in which the resemblance is observed, he characterises all the different classes, and by a comparison of these with each other, in respect to the number of resembling circumstances, he distributes his classes according to their generality and subordination: thus exhausting the whole assemblage, and leaving nothing unarranged but accidental varieties. In this procedure every grouping of similar events is, ipso facto, discovering a physical law; and the expression of this assemblage is the expression of that law. And, as every observation of this constancy of fact affords an opportunity for exerting the instinctive inference of natural connexion between the related subjects, every such observation is the discovery of a power, property, or quality, of natural substance. This observation of event is all we know of the connexion, all we know of the natural power. When the philosopher proceeds further to the arrangement of events, according to their various degrees of complication, he is making an arrangement of all natural powers according to their various degrees of subordinate influence. And thus his occupation is similar to that of the descriptive historian, classification and arrangement; and this seems to constitute all the science attainable by both.

Sect. III.—The Philosophy and Rules of Kepler, Sir Isaac Newton, &c.

In the above view philosophy may be defined the study of the phenomena of the universe, to discover the general laws which indicate the powers of natural substances, to explain subordinate phenomena, and to improve art: or philosophy is the study of the phenomena of the universe, with a view to discover their causes, to explain subordinate phenomena, and to improve art. The task is undoubtedly difficult, and will exercise our noblest powers. The employment is manly, and the result important. It therefore justly merits the appellation of philosophy, although its objects are nowise different from those which occupy the attention of other men.

A philosophical history of nature consists in a complete or copious enumeration and narration of facts, properly selected, cleared of all extraneous circumstances, and accurately narrated. This constitutes the materials of philosophy. We cannot give a better example of this branch of philosophical occupation than astronomy. From the beginning of the Alexandrian school to this day astronomers have been at immense pains in observing the heavenly bodies, to detect their true motions. This has been a work of prodigious difficulty: for the appearances are such as might have been exhibited although the real motion had been extremely different. Not that our senses give us false information; but we form hasty, and frequently false judgments, from these informations; and call those things deceptions of sense, which are in fact errors of judgment. But the true motions have at last been discovered, and described with such accuracy that the history may be considered as nearly complete. This is to be found in the usual systems of astronomy, where the tables contain a most accurate and synoptical account of the motion; so that we can tell with precision in what point of the heavens a planet has been seen at any instant that can be named. Sir Isaac Newton's Optics is such another perfect model of philosophical history, as far as it goes. This part of philosophy may be called phenomenology.

A general knowledge of the universe may thus be easily acquired and firmly retained, by classification and arrangement; which must proceed on resemblances observed in the events; the subsequent arrangement must be regulated by the distinctions of which those resemblances are still susceptible. This assemblage of events into groups must be expressed. They are facts; therefore the expression must be in propositions, which form, taken together, natural or physical laws.

This observation of physical laws is always accompanied by a reference of that uniformity of event to a natural bond of union between the concomitant facts, which is conceived by us as the cause of this concomitancy; and therefore this procedure of the philosopher is considered as the discovery of those causes, or powers of natural substances, which constitute their physical relations, and may justly be called their distinguishing qualities or properties. This view of the matter gives rise to a new nomenclature. We give to those powers generic names, such as sensibility, intelligence, irritability, gravity, elasticity, fluidity, magnetism, &c. These terms mark resembling circumstances of events; and no other definition can be given of them but a description of these circumstances. In a few cases which have been the subjects of more painful or refined discussion, we have proceeded farther in this abbreviation of language. Want of attention to the pure meaning of the words thus originated, has frequently occasioned very great mistakes in philosophical science. We shall give an instance of its most successful application to the class of events already adduced.

Kepler, the celebrated Prussian astronomer, having maturely considered the phenomena recorded in the tables and observations of his predecessors, discovered, amidst all the varieties of the planetary motions, three circumstances of resemblance, which are now known by the name of Kepler's laws. See ASTRONOMY, Index; and KEPLER. Long after this discovery of Kepler, Sir Isaac Newton found that these laws of Kepler were only particular cases of a fact or law still more general. He found that the deflections of the planets from uniform rectilineal motion were all directed to the sun; and that the simultaneous deflections were inversely proportional to the squares of the distances from him. Thus was established a physical law of vast extent: but further observation showed him, that the motion of every body of the solar system was compounded of an original motion of projection, combined with a deflection towards every other body; and that the simultaneous deflections were proportional to the quantity of matter in the body towards which they were directed, and to the reciprocal of the square of the distance from it. Thus was the law made still more general. He compared the deflection of the moon in her orbit with the simultaneous deflection of a stone thrown from the hand, and describing a parabola; and he found that they followed the same law, that is, that the deflection of the moon in a second was to that of the stone in the same time as the square of the stone's distance from the centre of the earth to the square of the moon's distance from it. Hence he concluded that the deflection of a stone from a straight line was just a particular instance of the deflections which took place through the whole solar system.

The deflection of a stone is one of the indications it gives of its being heavy; whence he calls it gravitation. He therefore expresses the physical law which obtains through the whole solar system, by saying that 'every body gravitates to every other body; and the gravitations are proportional to the quantity of matter in that other body, and inversely proportional to the square of the distance from it.' Thus we see how the arrangement of the celestial phenomena terminated in the discovery of physical laws; and that the expression of this arrangement is the law itself. Since the fall of a heavy body is one instance of the physical law, and since this fall is considered by all as the effect of its weight, and this weight is considered as the cause of the fall, the same cause is assigned for all the deflections observed in the solar system; and all the matter in it is found to be under the influence of this cause, or to be heavy; and thus his doctrine has been denominated the system of universal gravitation. Philosophers have gone farther, and have supposed that gravity is a power, property, or quality, residing in all the bodies of the solar system. Sir Isaac Newton does not say so. He contents himself with the immediate consequence of the first axiom in natural philosophy, viz. that every body remains in a state of rest, or of uniform rectilineal motion, unless affected by some moving force. Since the bodies of the solar system are neither in a state of rest, nor of uniform rectilineal motion, they must be considered as so affected; that is, that there operates on every one of them a moving force, directed towards all the others, and having the proportions observed in the deflection.

It is to our present purpose to show how the observation and arrangement of phenomena terminate in the discovery of their causes, or of the powers or properties of natural substances. This is a task of great difficulty, as it is of great importance. Of this difficulty there are two chief causes:

1. In most of the spontaneous phenomena of nature there is a complication of many events, and some of them escape our observation. Attending only to the most remarkable, we conjoin these only in our imagination, and are apt to think these the concomitant events in nature, the proper indication of the cause, and the subjects of this philosophical relation, and to suppose that

they are always conjoined by nature. Thus it was thought that there resided in a vibrating chord a power by which the sensation of sound was excited, or that a chord had a sounding quality. But late observations have shown clearly that there is an inconceivable number of events interposed between the vibration of the chord and the sensitive affection of our ear; and, therefore, that sound is not the effect of the vibration of the chord, but of the very last event of this series: and this is completely demonstrated by showing that the vibration and the sound are not necessarily connected, because they are not always connected, but require the interposition of air or of some other elastic body. These observations show the necessity of the most accurate and minute observations of the phenomena, that none of those intermediate events may escape us, and we be thus exposed to the chance of imaginary connexions between events which are far asunder in the procedure of nature. As the study has improved, mistakes of this kind have been corrected; and philosophers are careful to make their trains of events under one name as short as possible. Thus, in medicine, a drug is no longer considered as a specific remedy for the disease which is sometimes cured when it has been used, but is denominated by its most immediate operation on the animal frame: it is no longer called a febrifuge, but a sudorific.

2. When many natural powers combine their influence in a spontaneous phenomenon of nature, it is frequently very difficult to discover what part of the complicated effect is the effect of each, and to state those circumstances of similarity which are the foundation of a physical law, or entitle us to infer the agency of any natural power. The most likely method for insuring success in such cases is to get rid of this complication of events, by putting the subject into such a situation that the operation of all the known powers of nature shall be suspended, or so modified as we may perfectly understand their effects. We can thus appreciate the effects of such as we could neither modify nor suspend, or we can discover the existence of a new law, the operation of a new power. This is called making an experiment; and is the most effectual way of advancing in the knowledge of nature, and has been called experimental philosophy. See Sect. 5.

It seems, however, at first sight, in direct opposition to the procedure of nature in forming general laws. These are formed by induction from multitudes of individual facts, and must be affirmed to no greater extent than the induction on which they are founded. Yet it is a matter of fact, a physical law of human thought, that one simple, clear, and unequivocal experiment gives us the most complete confidence in the truth of a general conclusion from it to every similar case. Whence this anomaly? It is not an anomaly or contradiction of the general maxim of philosophical investigation, but the most refined application of it. There is no law more general than this, that 'Nature is constant in all her operations.' The judicious and simple form of our experiment insures us (we imagine) in the complete knowledge of all the circumstances of the event. Upon this supposition, and this alone, we consider the experiment as the faithful representative of every possible case of the conjunction.

The last branch of philosophic occupation is the explanation of subordinate phenomena. This is nothing more than the referring any particular phenomenon to that class in which it is included; or pointing out the general law, or that general fact, of which the phenomenon is a particular instance. Thus the feeling of the obligations of virtue is thought to be explained, when it is shown to be a particular case of that regard which every person has for his dearest interest. The rise of water in pumps is explained, when we show it to be a particular case of the pressure of fluids, or of the air. The general law under which we show it to be properly arranged is called the *principle* of the explanation, and the explanation itself is called the *theory* of the phenomenon. Thus Euler's explanation of the lunar irregularities is called the theory of the lunar motions on the principle of gravitation. This may be done either to advance our own knowledge of nature, or to communicate it to others. If done with the first view, we must examine the phenomenon minutely, and endeavour to detect every circumstance in it, and thus discover all the known laws of nature which concur in its production; we then appreciate the operation of each according to the circumstances of its exertion; we then combine all these, and compare the result with the phenomenon. If they are similar, we have explained the phenomenon. We cannot give a better example than Franklin's explanation of the phenomena of thunder and lightning.

'If we explain a phenomenon from known principles, we proceed synthetically from the general law already established, and known to exert its influence in the present instance. We state this influence both in kind and degree according to the circumstances of the case; and having combined them, we compare the result with the phenomenon, and show their agreement. Thus, because all the bodies of the solar system mutually gravitate, the moon gravitates to the sun as well as to the earth, and is continually, and in a certain determinate manner, deflected from that path which she would describe did she gravitate only to the earth. Her motion round the earth will be retarded during the first and third quarters of her orbit, and accelerated during the second and fourth. Her orbit and her period will be increased during our winter, and diminished during our summer. Her apogee will advance, and her nodes will recede; and the inclination of her orbit will be greatest when the nodes are in syzigee, and least when they are in quadrature. And all these variations will be in certain precise degrees. Then we show that all these things actually obtain in the lunar motions, and they are considered as explained. This summary account of the object and employment in all philosophical discussion is sufficient for pointing out its place in the circle of the sciences, and will serve to direct us to the proper methods of prosecuting it with success. Events are its object; and they are considered as connected with each other by causation, which may therefore be called the philosophical relation of things. The following may be adopted as the fundamental proposition on which all philosophical discussion proceeds, and under which every philosophical discussion or discovery may be arranged:—Every change that we observe in the state or condition of things is considered by us as an effect, indicating the agency, characterising the kind, and determining the degree of its inferred cause.'

What have the philosophers of all ages been employed about, but the discovery of the causes of those changes that are incessantly going on? Human curiosity has been directed to nothing so powerfully and so constantly as to this. Many absurd causes have been assigned for the phenomena of the universe; but no set of men have ever said that they happened without a cause. This is so repugnant to all our propensities and instincts, that even the atheistical sect, who, of all others, would have profited most by the doctrine, have never thought of advancing it. To avoid so shocking an absurdity, they have rather allowed that chance, and the concourse of atoms, are the causes of the beautiful arrangements of nature. The thoughtless vulgar are no less solicitous than the philosophers to discover the causes of things. Had men never speculated, their conduct alone gives sufficient evidence of the universality of the opinion. The whole conduct of man is regulated by it, nay almost wholly proceeds upon it, in the most important matters, and where experience seems to leave us in doubt; and to act otherwise, as if any thing whatever happened without a cause, would be a declaration of insanity. Dr. Reid has beautifully illustrated this truth, by observing, that even a child will laugh at you if you try to persuade him that the top, which he misses from the place where he left it, was taken away by nobody. You may persuade him that it was taken away by a fairy or a spirit, but he believes no more about this nobody, than the master of the house, when he is told that nobody was the author of a piece of theft or mischief. What opinion would be formed, says Dr. Reid, of the intellects of the juryman, on a trial for murder by persons unknown, who should say that the fractured skull, the watch and money gone, and other like circumstances, might possibly have no cause? he would be pronounced insane or corrupted.

The rules of philosophising which Newton premises to his account of the planetary motions, which he so scrupulously followed, and with a success which gives them great authority, are all in strict conformity to the view we have now given of the subject. The chief rule is, that similar causes are to be assigned to similar phenomena. This is indeed the source of all our knowledge of connected nature; and without it the universe would only present to us an incomprehensible chaos. It is by no means, however, necessary to enjoin this as a maxim for our procedure: it is an instinctive propensity of the human mind. It is absolutely necessary, on the contrary, to caution us in the application of this propensity. We must be extremely confident in the certainty of the resemblance before we venture to make any inference. We are prone to reason from analogy; the very employment is agreeable; and we are ever disposed to embrace opportunities of engaging in it. For this reason we are satisfied with very slight resemblances, and eagerly run over the consequences, as if the resemblances were complete; and thus our researches frequently terminate in falsehood.

This propensity to analogical reasoning is aided by another equally strong, and equally useful, when properly directed; we mean the propensity to form general laws: it is in fact a propensity to discover causes, which is equivalent to the establishing of general laws. It appears in another form, and is called a love of, or taste for, simplicity; and this is encouraged or justified, as agreeable to the uniformity and simplicity of nature. 'Natura semper sibi est similis et consona,' says Newton: 'Frustra fit per plura quod fieri potest per pauciora,' says another. The beautiful, the wise economy of nature, are phrases in every body's mouth; and Newton enjoins us to adopt no more causes than are sufficient to explain the phenomena. All this is very well, and is true in its own degree; but it is too frequently the subterfuge of human vanity and self-love. This inordinate admiration of the economy and simplicity of nature is generally enjoined with a manifest love of system, and with the actual production of some new system, where, from one general principle, some extensive theory or explanation is deduced or offered to the world. The author sees a sort of resemblance between a certain series of phenomena and the consequences of some principle, and thinks the principle adequate to their explanation. Then, on the authority of the acknowledged simplicity of nature, he roundly excludes all other principles of explanation; because, says he, this principle is sufficient, et frustra fit per plura, &c. We could point out many instances of this kind in the writings of perhaps the first mathematician, and the poorest philosopher of the last century; where extensive theories are thus cavalierly exhibited, which a few years examination have shown to be nothing but analogies, indistinctly observed, and, what is worse, inaccurately applied.

To regulate these hazardous propensities, and keep philosophers in the right path, Newton inculcates another rule, or rather gives a modification of this injunction of simplicity. He enjoins that 'no causes shall be admitted but such as are true, and sufficient to account for the phenomena.' See our article NEWTONIAN PHILOSOPHY, § 6. The meaning of this rule has been mistaken by many philosophers, who imagine that by true he means causes which really exist in nature, and are not mere creatures of the imagination. We have met with some who would boggle at the doctrines of Aristotle respecting the planetary motions, viz. that they are carried along by conducting intelligent minds, because we know of none such in the universe; and who would nevertheless think the doctrine of the Cartesian vortices deserving of at least an examination, because we see such vortices exist, and produce effects which have some reseblance to the planetary motions, and have justly rejected them, solely because this resemblance has been very imperfect. We apprehend Newton's meaning is, that no cause of any event shall be admitted, or even considered, which we do not know to be actually concurring or exerting some influence in that very event. If this be his meaning he would reject the Cartesian vortices, and the conducting spirits of Aristotle for one and the same reason; not because they were not adequate to the explanation, nor because such causes did not exist in nature, but because we did not see them any how concerned in the phenomenon under consideration. We neither see a spirit nor a vortex, and therefore need not trouble ourselves with enquiring what effects they would produce. This was his conduct, and has distinguished him from all philosophers who preceded him, though many, by following his example, have been rewarded by similar success. This has procured to Newton the character of the modest philosopher; and modest his procedure may be called, because the contrary procedure of others did not originate so much from ignorance as from vanity. Newton's conductor in this was not modesty, but sagacity, prudence, caution, and, in a word, sound judgment.

For the bonds of nature the supposed philosophical causes are not *observed;* they are *inferred* from the phenomena. When two substances are observed, and only when they are observed, to be connected in any series of events, we infer that they are connected by a natural power; but when one of the substances is not seen but fancied, no law of human thought produces any inference whatever. For this reason, Newton stopped short at the last fact which he could discover in the solar system, that all bodies were deflected to all other bodies, according to certain regulations of distance and quantity of matter. When told that he had done nothing in philosophy, that he had discovered no cause, and that to merit any praise he must show how this deflection was produced: he said that he knew no more than he had told them; that he saw nothing causing this deflection; and was contented with having described it so exactly that a good mathematician could now make tables of the planetary motions as accurate as he pleased, and with hoping, in a few years, to have every purpose of navigation and of philosophical curiosity completely answered. He was not disappointed. When philosophers were contriving hypothetical fluids, and vortices, which would produce these deflections, he contented himself with showing the total inconsistency of these explanations with the mechanical principles acknowledged by their authors; and that their causes were neither real, nor sufficient for explaining the phenomenon. A cause is sufficient for explaining a phenomenon only when its legitimate consequences are perfectly agreeable to these phenomena. Newton's discoveries remain without diminution or change: no philosopher has yet advanced a step further. But let not the authority, or even the success of Newton be our guide, farther than they are supported by experiment. If philosophy be only the interpretation of nature's language, the inference of causes from the phenomena, a fancied or hypothetical phenomenon can produce nothing but a fanciful cause, and can make no addition to our knowledge of real nature.

'It is in experimental philosophy alone that hypotheses can have any just claim to admission; and here they are not admitted as explanations, but as conjectures serving to direct our line of experiments. Effects only appear; and by their appearance, and the previous information of experience, causes are immediately ascertained by the perfect similarity of the whole train of events to other trains formerly observed. Or they are suggested by more imperfect resemblances of the phenomena; and these suggestions are made with stronger or fainter evidence, according as the resemblance is more or less perfect. These suggestions do not amount to a confidential inference, but only raise a conjecture. Wishing to verify or overturn this conjecture, we have recourse to experiment, and we put the subject under consideration in such a situation that we can say what will be the effect of the conjectural cause if real. In this way conjectures have their use, and are the ordinary means by which experimental philosophy is improved. But conjectural systems are worse than nonsense, filling the mind with false notions of nature, and generally leading us into a course of improper conduct, when they become principles of action. This is acknowledged even by the abettors of hypothetical systems themselves, when employed in overturning those of their predecessors, and establishing their own; witness the successive maintainers of the many hypothetical systems in medicine, which have had their short-lived course within these last two centuries. Let every person, therefore, who calls himself a philosopher, resolutely determine to reject all temptations to this kind of system-making, and let him never consider any composition of this kind as any thing better than the amusement of an idle hour.'

SECT. IV.—OF THE SYNTHETIC MODE OF PROSECUTING PHILOSOPHICAL INVESTIGATIONS.

The sphere of our intuitive knowledge is very limited; we must be indebted for the greatest part of our intellectual attainments to our rational powers, and it must be deductive. In the spontaneous phenomena of nature, whether of mind or body, it seldom happens that the energy of that natural power which is the principle of explanation is so immediately connected with the phenomenon that we see the connexion at once. Its exertions are frequently concealed, and in all cases modified, by the joint exertions of other natural powers; the particular exertion of each must be considered apart, and their mutual connexion traced out. It is only in this way that we can discover the train of intermediate operations, and see in what manner and degree the real principle of explanation concurs in the ostensible process of nature.

'In all such cases it is evident that our investigation must proceed by steps, conducted by the sure hand of logical method. To take an instance, let us listen to Galileo, while he is teaching his friends the cause of the rise of water in a pump. He says that it is owing to the pressure of the air. This is his principle; and he announces it in all its extent. 'All matter, says he, is heavy, and in particular air is heavy. He then points out the connexion of this general principle with the phenomenon.

'The rise of the water in the pump is shown to be a particular case of the general fact in hydrostatics, that fluids in communicating vessels will stand at heights which are inversely as their densities, or that columns of equal weights are in equilibrio.

'This way of proceeding is called arguing à priori, or the synthetic method. It is founded on just principles; and the great progress made in the mathematical sciences, by this mode of reasoning, shows to what length it may be carried with irresistible evidence. It has long been considered as the only inlet to true knowledge; and nothing was allowed to be known with certainty which could not be demonstrated in this way to be true. Accordingly logic, or the art of reasoning, was nothing but a set of rules for successfully conducting this argument.

'Under the direction of this infallible guide, philosophy has made sure progress towards perfection. The explanation of an appearance in nature is nothing but the arrangement of it into that general class in which it is comprehended. The class has its distinguishing mark, which, when it is found in the phenomenon, fixes it in its class, there to remain for ever an addition to our stock of knowledge. Nothing can be lost any other way but by forgetting it; and the doctrines of philosophers become stable as the laws of nature.'

The Aristotelian logic, the syllogistic art, that art so much boasted of, as the only inlet to true knowledge, the only means of discovery, was in direct opposition to the procedure of nature, by which we acquire knowledge and discover truth. The ancient logic supposed that all the first principles are already known, and that nothing is wanted but the application of them to particular facts. But, were this true, the application of them can hardly be called a discovery; but it is false, and the fact is that the first principles are generally the chief objects of our research, and that they have come into view only now and then as it were by accident, and never by the labors of the logician. But curiosity was awakened, and men of genius were fretted as well as disgusted with the disquisitions of the schools, which one moment raised expectations by the symmetry of composition, and the next moment blasted them by their inconsistency with experience. They saw that the best way was to begin anew, to throw away the first principles altogether, without exception, and endeavour to find out new ones, which should in every case be agreeable to fact. 'Philosophers began to reflect that under the unnoticed tuition of nature men had acquired much useful knowledge. The exercise of the inductive principle, by which nature prompts us to infer general laws from the observation of particular facts, gives a species of logic new in the schools, but old as human nature. It is a just and rational logic; for it is founded on, and indeed is the only habitual appellation of, this maxim, 'That whatever is true with respect to every individual of a class of events is true of the whole class.' This is just the inverse of the maxim on which the Aristotelian logic proceeded.

This has given a new turn to the whole track of philosophical investigation. To discover first principles we must make extensive and accurate observations, so as to have copious inductions of facts, that we may not be deceived as to the extent of the principle inferred from them. We must extend our acquaintance with the phenomena, paying a minute attention to what is going on all around us; and we must study nature, not shut up in our closet, drawing the picture from our own fancy, but in the world, copying our lines from her own features. To delineate human nature we must see how men act. To give the philosophy of the material world we must notice its phenomena. This method of studying nature has been prosecuted during these last two centuries with great eagerness and success. Philosophers have made accurate observations of facts, and copious collections of them. Men of genius have discovered many general powers both of mind and body; and resemblances among these have suggested powers still more general. By these efforts investigation became familiar; hypotheses were banished, and nothing was admitted as a principle which was not inferred from the most evident inductions. Conclusions from such principles became every day more conformable to experience. Mistakes sometimes happened; but, recourse being had to more accurate observation or more certain induction, the mistakes were corrected. In the present study of nature, our steps are more slow, hesitating, and painful; our conclusions are more limited and modest; but our discoveries are more certain and progressive, and the results are more applicable to the purposes of life. This pre-eminence of modern philosophy over the ancient is seen in every path of enquiry. It was first remarkable in the study of the material world; and there it still continues to be most conspicuous. But it is no less to be seen in the later enquiries of philosophers in metaphysics and ethics, where the mode of investigation by analysis and experiment has been greatly adopted; and this has restored philosophers to the world and to society. They are no longer to be found only in the academies of the sophists and the cloisters of the convent, but in the discharge of public and private duty.

Not to expatiate on the great variety of corporeal pleasures, which the present state of human existence affords, man has improved this anxious desire of the knowledge of the objects around him, so as to derive from them not only the means of subsistence and comfort, but the most elegant and pleasing of all gratifications, the accumulation of intellectual knowledge, independent of all consideration of its advantages. It is therefore not only lawful but highly commendable, in such as possess the means of intellectual improvement, without relinquishing the indispensable social duties, to push this advantage as far as it will go: and in all ages and countries it has been considered as forming the best and highest distinction between man and man.

Sect. V.—Of Experimental Philosophy.

Experimental philosophy is that which has its foundation in experience, wherein nothing is assumed as a truth but what is founded upon ocular demonstration, or which cannot be denied without violating the common sense and perceptions of mankind. It proceeds entirely on experiments; deduces the laws of nature, and the powers and properties of bodies, with their effects on each other, from experiments and observations.

Philosophers in former times, when reasoning upon the appearances and operations of nature, instead of following this method, assumed such principles as they imagined sufficient for explaining the phenomena. Hence for a great number of ages experiment was abandoned; no progress was made in science; but systems were heaped upon systems, having neither consistency with one another nor with themselves.

The first who deviated from this method of philosophising was the celebrated Roger Bacon, who lived in the thirteenth century, and who is said to have spent £2000 (an immense sum in those days) in making experiments. The admirable Crichton, who flourished about the year 1580, not only disputed against the philosophy of Aristotle, which had for so long been in vogue, but wrote a book against it. Contemporary with this celebrated person was Francis lord Bacon, to whom we have so largely referred, and who was in truth the founder of the experimental philosophy of modern times. In this luminous path followed sir Isaac Newton; but, unfortunately, neither Bacon nor Newton had an opportunity of becoming acquainted with many important facts which have since been brought to light. Their experimental philosophy was merely mechanical, or derived from the visible operations of solid bodies, or of the grosser fluids. A remarkable instance of the errors into which they were thus betrayed we have in the doctrine of projectiles, in which the most enormous deviations from truth were sanctified by the greatest names in the seventeenth century, merely by reasoning from the resistance of the air to bodies moving slowly and visibly, to its resistence to the same bodies when moved with high degrees of velocity. See Projectiles. In other cases they were reduced to make use of words to express immechanical powers, as attraction, repulsion, refraction, &c., which have since tended in no small degree to embarrass and confound science by the disputes that have taken place concerning them.

The great foundations of the present system of experimental philosophy may be thus exhibited:

1. All the material substances of which the universe is composed are called natural bodies. What we perceive uniform and invariable in these substances we call their properties. Some of these are general and common to all matter, as *extension;* others are proper to particular substances, as for instance *fluidity;* while some appear to be compounded of the general and particular properties, and thus belong to a still smaller number; as the properties of air, which are derived from the general property of extension, combined with fluidity, elasticity, &c.

2. In taking a particular review of the properties of bodies we naturally begin with that of *extension*. This manifests itself in the three dimensions of length, breadth, and thickness. Hence proceeds the divisibility of matter, which our modern system supposes to reach even to infinity; but, though this proposition be supported by mathematical demonstrations, it is impossible we can either have any distinct idea of it, or of the opposite doctrine, which teaches that matter is composed of excessively minute particles called atoms, which cannot be divided into smaller ones. The subtilty indeed to which some bodies may be reduced by mechanical means is surprising; and in some cases is so great, that we might be tempted to suppose that a farther division is impossible. Thus, in grinding a speculum, the inequalities of its surface are so effectually worn off, that the whole becomes in a certain degree invisible, showing not itself by the light which falls upon it, but the image of other bodies; but the smallest scratch which disturbs the equality of the surface is at once distinctly visible.

3. From the arrangement of these ultimate particles of matter, whatever we suppose them to be, arises the various figures of bodies: and hence figure is a property of all bodies no less universal than extension, unless we speak of the ultimate particles of matter, which, as they are supposed to be destitute of parts, must consequently be equally destitute of figure; and the same consequence will follow whether we adopt this supposition or the other. The figures of bodies are so extremely various and dissimilar that it is impossible to find any two perfectly alike. In most indeed the dissimilarity may be perceived by the naked eye; but the microscope quickly discovers new varieties of figure, and the imbecility of our senses in this respect. Solidity is another property essential to all matter. By this we mean that property which one quantity of matter has of excluding all other from the space which itself occupies at that time. Hence arises what we call *resistance*, which is always an indication of solidity; and no less so in those bodies which we call fluid than in those which are the most solid. This may at first seem to be a contradiction; but fluids yield only when they can get away from the pressure; in all other cases they resist as violently as the most solid bodies. Thus water confined in a tube will as effectually resist the impression of a piston thrust down upon it as though it were the most solid substance.

4. The distance of the parts of bodies from each other is called their *porosity*, and was formerly supposed to be owing to a vacuum interspersed between them; it is now chiefly regarded in a comparative point of view. The porosity of bodies with regard to one another, may be thus explained:—Wood, or a sponge, is porous with regard to water; but water itself is porous with regard to air, which it absorbs in considerable quantity. Both air and water again are po-

rous with regard to heat, which produces very considerable changes upon them, according to the quantity of it they contain, or the manner it acts in their pores. Vacuities of this kind indeed are supposed to be absolutely necessary to motion: for though we may say, matter being divisible almost ad infinitum, that a body or substance more solid may move in another substance that is more subtle, and that will give way to its motion, we must nevertheless have recourse to a last resort, and admit of an ultimate vacuum, which will give room sufficient to the least corpuscle, that its part A may take the place of its part B without the least resistance; besides, it is not to be imagined that nature, in fact, admits of that infinite divisibility which our imagination can conceive, and that every thing, which is possible in idea, is at all times practicable. All that exists is possible, but all that is possible does not however exist. By *density* is understood the proportion between the extension and solidity of a body; one body, therefore, is more dense than another, when, under the same degree of extension, it contains more solid matter: and this quality arises from condensation and compression. *Elasticity* is nothing more than that effort by which certain bodies, when compressed, endeavour to restore themselves to their former state; and this property supposes them compressible. As all these natural properties of bodies are of great utility in explaining the principles of physics, and in applying them to all the arts, experimental philosophy proves their reality by a thousand examples.

5. We discover still other properties in bodies; such as *mobility*, which we must not here confound with motion: for mobility arises from certain dispositions which are not in an equal degree in all bodies; whence it comes that some are more easily moved than others: and this proceeds from the resistance to motion which is perceived in all bodies having regard merely to their masses; and this resistance is called vis inertiæ, or inert force. A body is said to be in motion when it is actually moving from one place to another; or whenever a body changes its situation with regard to the objects that surround it, either nearly or remotely, it is said to be in motion. There are three principal matters to be considered in a moving body: its direction, its velocity, and the quantity of its motion; and here physics explain the force of moving power; they likewise distinguish between simple and compound motion. Simple motion is that which arises from only one force, or which tends to only one point. It describes the laws, and explains the resistance of mediums; the resistance of friction; the difficulties of a perpetual motion; the alteration of direction occasioned by the opposition of a fluid matter; reflected or reverberated motion; the communication of motion by the shock of bodies, &c. Compound motion is that of a body impelled to move by several causes or powers which act according to their different directions. Physics here likewise investigates the laws of motion; and is particularly applied to the explaining, under this head, what are called the central forces, which produce a motion that is either circular or in a curve line, and which incessantly urge the moving body either to approach or recede from the centre. To distinguish these from each other, the former is called the centripetal force, and the latter the centrifugal force.

6. The powers of *attraction* and *repulsion* seem to be common to all matter, and the component parts of all substances are kept in their places by the due balance of these opposite powers. If, by any means, the particles of any substance be removed beyond their sphere of mutual attraction, they repel one another, as those of water when it becomes steam. Of the different kinds of attraction, that of *gravitation* seems to extend to the greatest possible distance; but that which keeps together the parts of the same substance, thence called the attraction of cohesion, and the different kinds of chemical attractions called affinities, only act at a small distance. Of the causes of these attractions we are entirely ignorant. See ATTRACTION.

7. By *gravity*, or *ponderosity*, is to be understood that force which occasions bodies to pass from a higher to a lower place, when nothing opposes their course, or when the obstacles are not sufficient to stop them. Speculative philosophy investigates its cause, and perhaps in vain. Experimental philosophy contents itself with describing the phenomena, and teaching the laws of gravity, which are thoroughly established by a thousand reiterated experiments. In order properly to understand this subject, we must take care not to confound the term gravity with that of weight. By the former we understand that force which urges bodies to descend through a certain space in a given time. By the latter is meant the quantity of a heavy body that is contained under the same bulk. The phenomena are explained by the experiments themselves, and by inferences deduced from them. *Hydrostatics* is a science of which the object is the gravity and equilibrium of fluids in particular. Though the gravity of these bodies is the same with that of others, and is subject to the same laws, yet their state of fluidity gives rise to particular phenomena, which it is of consequence to know. But, as hydrostatics cannot be successfully treated on without the assistance of calculation, it has been ranked among the mathematical sciences. See HYDROSTATICS. We say the same with regard to *mechanics*, which is the art of employing, by the aid of machines, the motion of bodies, in conformity to its properties and laws, as well with regard to solids as fluids, either more commodiously or more advantageously.

After it has made the most accurate experiments and observations on the general properties of bodies, experimental philosophy passes to the examination of the air, water, heat, light, colors, &c. The air is a fluid with which we are surrounded from the instant of our birth, and without which we cannot exist. It is by the properties and the influences of the air, that nature gives increase and perfection to all that it produces for our wants and conveniencies; it is the spirit of navigation: sound, voice, speech itself, are nothing more than percussions of the air; this globe that we inhabit is completely surrounded by air; and this kind of coverture, commonly called the *atmosphere*, has that variety of remarkable functions which perpetually stimulates and rewards the most diligent research. Experimental physics, therefore, considers the air, 1. Of itself, independently of its bulk, and the figure of its whole body; it examines its essential properties; as its gravity, density, elasticity, &c. The air-pump is here of indispensable use; and examines in what manner space, or a vacuum, is made; demonstrates the necessity of air to the preservation of animal life; the effect it has on sound, fire, and gunpowder, in vacuo; and a hundred other facts of various degrees of curiosity. 2. It considers the air of the terrestrial atmosphere, sometimes as a fluid at rest, and sometimes as in motion. And by these means it accounts for the variation of the mercury in the barometer, and why it sinks in proportion as the height of the atmosphere diminishes; as also for its figure, extent, and weight; it shows the method of determining the height of mountains, the nature of sound in general, of its propagation, and of sonorous bodies. 3. Its chemical qualities and properties, in which are to be traced some of the most splendid discoveries of modern science. See AEROLOGY, AIR, ATMOSPHERE, &c.

But we cannot further particularise. It will suffice to remark here that the best tendency of modern philosophy is to reduce to experiment every part of natural science; to break up and away from system; and to make every part of what is taught for philosophy only a more enlarged index of nature.

PHILOSTORGIUS, an ecclesiastical historian of the fourth century, born in Cappadocia, who wrote an abridgment of ecclesiastical history, in which he treats Athanasius with severity. This work contains many curious and interesting particulars. The best edition is that of Henry de Valois in Greek and Latin. There is also attributed to him a book against Porphyry.

PHILOSTRATUS (Flavius), an ancient Greek author, who flourished between A.D. 190 and 244. He wrote The Life of Apollonius Tyanæus, and some other tracts still extant. Eusebius calls him an Athenian, because he taught at Athens; but Eunapius and Suidas always speak of him as a Lemnian: and he himself hints as much in his Life of Apollonius. He frequented the schools of the sophists, particularly Damiamus of Ephesus, Proclus Naucratitas, and Hippodromus of Larissa. He was one of those learned men whom the philosophic empress Julia Augusta, wife of Severus, had continually about her. By her command he wrote the Life of Apollonius, as he himself informs us. Suidas and Hesychius say that he was a teacher of rhetoric, first at Athens, and then at Rome, from the reign of Severus to that of Philip, who obtained the empire in 244. Philostratus's Life of Apollonius has erroneously been attributed to Lucian, because it has been printed with some of that author's pieces. Philostratus endeavours, as Cyril observes, to represent Apollonius as a wonderful and extraordinary person. The sophistical and affected style of Philostratus, the sources whence his materials have been drawn, and the absurdities and contradictions with which he abounds, plainly show his history to be nothing but a collection of fables. His works, however, have engaged the attention of critics of the first class. A very exact and beautiful edition was published at Leipsic, 1709, in folio, by Olearius, professor of Greek and Latin: and a translation into English has been published by Blount. At the end of Apollonius's Life there are ninety-five letters which go under his name. They are not, however, believed to be his. Some of them, though it is not easy to determine which, were written by his nephew; as were also the last eighteen in the Book of Images. This is the reason why the title runs not Philostrati, but Philostratorum quæ supersunt omnia.

PHILOSTRATUS, nephew of the preceding, flourished in the reign of Heliogabalus, and wrote an Account of the Lives of the Sophists, which is extant, and contains many particulars which are to be met with no where else. There were other two Philostrati, both philosophers, who flourished, the one under Augustus, the other under Nero.

PHILOTAS, the name of two generals, who fought under Alexander the Great. To one of them Cilicia was allotted, on his death. A third, who also fought bravely under Alexander, was the son of Parmenio; but was put to death for conspiring against that monarch; A.A.C. 330.

PHILOTIS, a servant maid at Rome, who saved her countrymen from destruction. After the siege of Rome by the Gauls, the Fidenates assembled an army, and marched against the capital, demanding all the wives and daughters in the city as the only conditions of peace. The demand astonished the senators; and, when they refused to comply, Philotis advised them to send all their female slaves disguised in matron's clothes, and she offered to march herself at their head. Her advice was followed: and when the Fidenates had feasted late in the evening, and were quite intoxicated and fallen asleep, Philotis lighted a torch as a signal for her countrymen to attack the enemy. The whole was successful; the Fidenates were conquered; and the senate, to reward the fidelity of the female slaves, permitted them to appear in the dress of the Roman matrons.

PHILOXENUS, a dithyrambic poet of Cythera. He enjoyed the favor of Dionysius, tyrant of Sicily, for some time, till he offended him by seducing one of his female singers. During his confinement he wrote an allegorical poem, called Cyclops; in which he delineated the character of the tyrant under the name of Polyphemus, and represented his mistress under that of Galatæa, and himself under that of Ulysses. The tyrant, who was fond of poetry and applause, liberated Philoxenus; but the poet refused to purchase his liberty by saying things unworthy of himself, and applauding the wretched verses of Dionysius, who therefore sent him to the quarries. Being set at liberty, he some time after was asked his opinion at a feast about some verses which Dionysius had repeated, and which the courtiers had received with the greatest applause. Philoxenus gave no answer, but ordered the guards that surrounded the tyrant's table to take him back to the quarries. Dionysius was pleased with his humor and firmness, and forgave him. Philoxenus died at Ephesus about A. A. C. 380.

PHILOXENUS, 1. An officer of Alexander, who received Cilicia at the general division of the provinces. He seems to be confounded with Philotas. 2. A son of Ptolemy, who was given to Pelopidas as a hostage.

PHIL'TER, *n. s.* & *v. a.* Fr. *philtre*; Greek φιλτρον. Something to cause love; to charm or induce to love.

> The melting kiss that sips
> The jellied *philtre* of her lips. *Cleaveland.*

> This cup a cure for both our ills has brought,
> You need not fear a *philter* in the draught. *Dryden.*

> Let not those that have repudiated the more inviting sins, shew themselves *philtred* and bewitched by this. *Government of the Tongue.*

> On high, where no hoarse winds nor clouds resort,
> The hood-winked goddess keeps her partial court;
> Upon a wheel of amethyst she sits,
> Gives, and resumes, and smiles, and frowns by fits.
> In this still labyrinth around her lie
> Spells, *philtres*, globes, and schemes of palmistry.
> *Garth's Dispensary.*

> A *philter* that has neither drug nor enchantment in it, love if you would raise love. *Addison.*

PHILTER is derived from the Greek φιλεω, I love, or φιλος, a lover. Philters are distinguished into true and spurious, and were given by the Greeks and Romans to excite love. The spurious are spells or charms, supposed to have an effect beyond the ordinary laws of nature by some magic virtue. Many grave authors have believed the reality of these philters, and alleged facts in confirmation of their sentiments; among the rest, VAN HELMONT.

PHILTER, or PHILTRE. Lat. philtrum. In pharmacy, &c., a strainer.

PHILYRA, in fabulous history, one of the Oceanides, whom Saturn met in Thrace. The god, to escape from the vigilance of Rhea, changed himself into a horse, to enjoy the company of Philyra, by whom he had a son, half a man and half a horse, called Chiron. Philyra was so ashamed of giving birth to such a monster, that she entreated the gods to change her nature. She was accordingly metamorphosed into a tree, called by her name among the Greeks.

PHIMOSIS, or rather PHYMOSIS, in medicine, Gr. φίμωσις, a disorder in the glans penis, when it is bound too tight by the præputium and cannot be uncovered: also a firm carnosity of the anus.

PHINEAS, or PHINEHAS, or, as the Jews pronounce it, Pinchas, the son of Eleazar, and grandson of Aaron. He was the third high priest of the Jews, and discharged this office from A. M. 2571 till 2590. He was particularly commended in Scripture for the zeal he showed for the preservation of his countrymen from idolatry, on two different occasions; Num. xxv. 7—15, and Josh. xxii. 13—34. The dignity of the high priesthood continued in the race of Phineas, from Aaron down to the high priest Eli, for about 335 years; when it was forfeited by the wickedness of Eli's sons. It returned, however, again into the family of Eleazar in the reign of Saul, who, having killed Abimelech, and the other priests and people of Nob, gave the high-priesthood to Zadok, of the race of Phinehas. At the same time David had Abiathar with him, of the race of Eli, who performed the functions of high priest. So that, after the death of Saul, David continued the priesthood to Zadok and Abiathar conjointly. But, towards the end of David's reign, Abiathar having joined in the conspiracy of Adonijah, to the prejudice of Solomon, he was disgraced, and Zadok only was acknowledged. The priesthood continued in his family till after the captivity of Babylon, and even to the destruction of the temple. From the beginning of Zadok's priesthood alone, and the exclusion of Abiathar, to the ruin of the temple, is 1084 years. As Phineas lived after the death of Joshua, and before the first servitude under Cushan-rishathaim, during the republic (Judges xvii. 6, xviii. 1, xxi. 24), his death is supposed to have happened A. M. 2590. The rabbies allow a very long life to Phineas. Some say he lived to the time of the high priest Eli, or even to that of Samson.

PHINEUS, in fabulous history, was son of Agenor, king of Phœnicia, or, according to some, of Neptune. He became king of Thrace or Bithynia. He married Cleopatra or Cleobula, the daughter of Boreas, by whom he had Plexippus and Pandion. After her death, he married Idæa or Idothæa, the daughter of Dardanus. Idæa, jealous of his former wife's children, accused them of attempts upon their father's life and crown, or, as others assert, of attempts upon her virtue; on which they were condemned by Phineus to be deprived of their eyes. This cruelty was soon after punished by the gods; for Phineus suddenly became blind, and the harpies were sent by Jupiter to keep him in continual alarm, and to spoil the meats on his table. He was afterwards delivered from these monsters by his brothers-in-law Zetes and Calais, who pursued them as far as the Strophades. He likewise recovered his sight by means of the Argonauts, whom he had received with great hospitality, and whom he instructed in the easiest and speediest way of arriving at Colchis. He was killed by Hercules.

PHINTIA, an ancient town of Sicily, at the mouth of the Chimera.—Cicero, in Verr.

PHIPPS (Constantine John), lord Mulgrave, F.R.S., a late celebrated British navigator, born in 1746. He was great grandson of Constantine Phipps, lord chancellor of Ireland in 1714, and son of Constantine, the first lord Mulgrave, by Catharine, daughter of the earl of Anglesea. He succeeded his father in 1775. He entered young into the naval service, under his uncle, the earl of Bristol. He was elected M. P. for Lincoln, and became an able speaker. He was also eminent as a naval commander, and made a voyage to the North Pole, from June 4th, to September 24th, 1773, to determine how far navigation was practicable to the north pole; an account of which he published in 1774. He is also said to have written the masterly Introduction to Captain Cook's last Voyage. He married Anne Elizabeth, daughter of Nathaniel Cholmondeley, esq. of Housham, in Yorkshire, a rich heiress, who died in 1780, leaving a daughter. He was created a British peer June 17th, 1790; and died at Liege, October 10th, 1792; leaving a large fortune, and one of the completest libraries in England, for works on naval science.

PHIZ, *n. s.* A ridiculous contraction of physiognomy; the face, in a sense of contempt.

His air was too proud, and his features amiss,
As if being a traitor had altered his *phiz*. *Stepney.*

The emphatic speaker dearly loves to oppose,
In contact inconvenient, nose to nose;
As if the gnomon on his neighbour's *phiz*
Touched with the magnet had attracted his. *Cowper.*

PHLEBOTOMIZE, *n. s.* & *v. a.* } Fr. *phlebotomie;*
PHLEBOT'OMY, *n. s.* }
Gr. φλεβοτομία, φλεψ, φλεβος, vena, and τεμνω, to cut. Bloodletting; the act or practice of opening a vein for medical intentions; to let blood.

Pains for the spending of the spirits, come nearest to the copious and swift loss of spirits by *phlebotomy*. *Harvey.*

Phlebotomy is not cure, but mischief; the blood so flowing as if the body were all vein. *Holyday.*

The frail bodies of men must have an evacuation for their humours, and be *phlebotomized*. *Howel's England's Tears.*

Although, in indispositions of the liver or spleen, considerations are made in *phlebotomy* to their situation, yet, when the heart is affected, it is thought as effectual to bleed on the right as the left. *Browne.*

PHLEGETHON, Gr. φλεγεθω, i. e. burning, in mythology, a river of Hell, whose waters flamed.—Virg. Æn. vi. 550.

PHLEGM, *n. s.* } Fr. *phlegme;* Greek
PHLEG'MAGOGUES, } φλεγμα. A watery ani-
PHLEGMAT'IC, *adj.* } mal humor, formerly supposed to produce sluggishness; phlemagogues are purges to evacuate phlegm: phlegmatic is, abounding in phlegm; dull.

A neat's foot, I fear, is too *phlegmatick* a meat. *Shakspeare.*

The putrid vapours, though exciting a fever, do colliquate the *phlegmatick* humours of the body. *Harvey.*

Negroes, transplanted into cold and *phlegmatick* habitations, continue their hue in themselves and generations. *Browne.*

Make the proper use of each extreme,
And write with fury, but correct with *phlegm*. *Roscommon.*

A linen cloth, dipped in common spirit of wine, is not burnt by the flame, because the *phlegm* of the liquor defends the cloth. *Boyle.*

The pituitous temper of the stomachick ferment must be corrected, and the *phlegmagogues* must evacuate it. *Floyer.*

As the inhabitants are of a heavy *phlegmatick* temper, if any leading member has more fire than comes to his share, it is quickly tempered by the coldness of the rest. *Addison.*

Spirit of wine is inflammable by means of its oily parts, and, being distilled often from salt of tartar, grows by every distillation more and more aqueous and *phlegmatick*. *Newton.*

Chewing and smoking of tobacco is only proper for *phlegmatick* people. *Arbuthnot on Aliments.*

He who supreme in judgment, as in wit,
Might boldly censure, as he boldly writ,
Yet judged with coolness, though he sung with fire;
His precepts teach but what his works inspire.
Our critics take a contrary extreme,
They judge with fury, but they write with *phlegm*. *Pope.*

Let melancholy rule supreme,
Choler preside, or blood or *phlegm*,
It makes no difference in the case,
Nor is complexion honour's place. *Swift.*

Who but a husband ever could persuade
His heart to leave the bosom of thy love,
For any *phlegmatick* design of state! *Southern.*

PHLEGM, in the animal economy, was one of the four humors whereof the ancients supposed the blood to be composed. The chemists make phlegm or water an elementary body; the characters of which are fluidity, insipidity, and volatility.

PHLEGMASIA, an order of diseases, in Dr. Cullen's system of physic. See MEDICINE, Index.

PHLEG'MON, *n. s.* } Gr. φλεγμονη. An
PHLEG'MONOUS, *adj.* } inflammation; burning tumor; inflammatory.

Phlegmon, or inflammation, is the first degeneration from good blood, and nearest of kin to it. *Wiseman.*

It is generated secondarily out of the dregs and remainder of a *phlegmonous* or oedematic tumour. *Harvey.*

PHLEGON, surnamed Trallianus, was born in Trallis, a city of Lydia. He was the emperor Hadrian's freed man, and lived to the eighteenth year of Antoninus Pius. He wrote several works of great erudition, of which we have nothing left but fragments. Among these was a History of the Olympiads, A Treatise of Long-lived Persons, and another of Wonderful Things. The titles of part of the rest of Phlegon's writings are preserved by Suidas. It has been supposed that the History of Hadrian, published under Phlegon's name, was written by Hadrian himself. A passage quoted by Eusebius from one of his works, respecting an extraordinary eclipse of the sun attended by an earthquake, has been supposed to allude to the darkness and earthquake that happened at our Saviour's passion. But this has been disputed among the learned; Whiston and others taking the affirmative, and Sykes the negative.

PHLEGYÆ, an ancient people of Thessaly, who, under their leader Phlegyas, plundered and burnt the temple of Apollo at Delphi. A few of them afterwards settled at Phocis.—Paus. ix. 36, Hom. Il. 13.

PHLEGYAS, in fabulous history, a son of Mars, king of the Lapithæ in Thessaly, and father of Ixion, and of Coronis, the mother of Æsculapius by Apollo. Phlegyas, in revenge for his daughter's disgrace, collected an army of the Phlegyæ, and plundered and burnt Apollo's temple; for which Apollo killed him and placed him in hell, with a large stone ready to fall on his head.—*Paus.* ix. 36, *Ovid. Met.* v. 87.

PHLEME, *n. s.* Lat. *phlebotomus*. Commonly written fleam. An instrument placed on the vein, and driven into it with a blow; particularly in bleeding of horses.

PHLEUM, in botany, cat's-tail grass, a genus of the digynia order, and triandria class of plants; natural order fourth, gramina.

PHLIAS, the son of Bacchus and Ariadne, one of the Argonauts.—Paus. ii. 12.

PHLOGISTIC, from phlogiston. Inflammatory; of or belonging to phlogiston, or inflammability. In this sense it is used by Dr. Cullen of inflammatory diseases. Dr. Brown, also, in his first edition of his Elementa Medicinæ, used this word in a sense somewhat similar, and the opposite term antiphlogistic for diseases of debility; but he afterwards changed these terms to sthenic and asthenic as more proper to express diseases of strength and weakness.

PHLOGISTICATED, in chemistry, impregnated with the imaginary principle of phlogiston; a term and doctrine now nearly obsolete.

PHLOGISTON was formerly used by chemists to express a principle which was supposed to enter the composition of various bodies, but which is now exploded. The bodies which were thought to contain it in the largest quantity are the inflammable substances; and the property which these substances possess of being susceptible of inflammation was thought to depend on this principle; and hence it was sometimes called the principle of inflammability. Inflammation, according to this doctrine, was the separation of this principle, or phlogiston, from the other matter which composed the combustible body. As the emission of light and heat always attended its separation, the chemists concluded that it was light and heat combined with other matter in a peculiar manner, or that it was some highly elastic and very subtile matter, on certain modifications of which heat and light depended. But its existence, as a chemical principle in the composition of bodies, is now fully proved to be false. Sir Isaac Newton was the first who established chemistry on scientific ground. From his time till the middle of the eighteenth century no real improvement was made. The progress this science has made since that period is owing to the important discovery of the existence of heat in a state of composition with other matter. Heat, thus combined, loses its activity, or becomes insensible, just as acids, or any other active substance, lose their apparent qualities in composition. Heat, in this combined state, was called by its ingenious discoverer, Dr. Black, latent heat, and it was found to be very abundant in the atmosphere, which owes its existence as an elastic fluid to the quantity of latent heat that it contains. After this discovery, Crawford, considering that air was absorbed by a burning body, concluded that the heat which appears in the combustion of a combustible body is the heat that had before existed in the air which was consumed by the burning body. Lavoisier and others, prosecuting this enquiry, found that the combustible body, while it is burning, unites with the basis of the air, and that the heat which the air contained, and which was the cause of the air existing in the state of air, is expelled. See, however, this theory more fully elucidated under CHEMISTRY, HEAT, OXYGEN, &c.

PHLOGOTICA. Phlogoticus; from φλεγω, to burn. The name of the second order of the class hæmatica, in Good's Nosology. Inflammations. Its genera are apostema, phlegmone, phyma, ionthus, phlysis, erythema, empresma, ophthalmia, catarrhus, dysenteria, bucnemia, arthrosia.

PHLOMIS, the sage-tree, or Jerusalem sage; a genus of the gymnospermia order, and didynamia class of plants: natural order forty-second, verticillatæ. There are fourteen species, all of which have perennial roots, and of many the stalks also are perennial. The latter rise from two to five or six feet high; and are adorned with yellow, blue, or purple flowers in whorls. They are all ornamental plants; and deserve a place in gardens, as they are sufficiently hardy to endure the ordinary winters in this climate: they require, however, a pretty warm situation. There are two species peculiarly adapted to the shrubbery, viz.

1. P. fructicosa, a native of Spain and Sicily. Of this there are three varieties, 1. The broad-leaved Jerusalem sage-tree is now very common in our gardens. Its beauty is great, and its culture very easy. It grows to about five feet high, and spreads its branches without order all around. The old branches are covered with a dirty, greenish, dead, falling, ill-looking bark; and this is the worst property of this shrub; but the younger shoots are white and beautiful; they are four-cornered, woolly, and soft to the touch. The leaves are roundish, oblong, and moderately large; these grow opposite at the joints of the shrub on long foot-stalks. They are hoary to a degree of whiteness, and their foot-stalks are woolly, white, tough, and strong. The flowers are produced in June, July, and August, at the top joints of the young shoots, in large whorled bunches. They are labiated, each consisting of two lips, the upper end forked, and bending over the other. The color is a most beautiful yellow, and, being large, they exhibit their golden flowers at a great distance. 2. The narrow leaved Jerusalem sage-tree is of lower growth than the other, seldom rising higher than a yard or four feet. This shrub is in every respect like the other; only the shoots have a more upright tendency. The leaves also are narrower, and more inclined to a lanceolate form: they are numerous in both sorts, and hide the deformity of the bark on the older stems. In short, these sorts are qualified for shrubberies of all kinds, or to be set in borders of flower-gardens, where they will flower, and be exceeded by very few shrubs. 3. The Cretan sage-tree is still of lower growth than either of the former, seldom arising to a yard in height. The leaves are of the same white hoary nature; they are very broad, and stand on long foot-stalks. The flowers are of a delightful yellow color, very large, and grow in large whorls, which give the plant great beauty.

2. P. purpurea, purple phlomis, or Portugal sage, four feet high; the stalks woody, and sending forth several angular branches, which are covered with a white bark. The leaves are spear-shaped, oblong, woolly underneath, crenated, and grow on short foot-stalks. The flowers

are produced in whorls from the joints of the branches. They are of a deep purple color, and have narrow involucra. They appear in June and July, but are not succeeded by ripe seeds in England. There is a variety of this species with iron-colored flowers, and another with flowers of a bright purple. There are some other shrubby sorts of phlomis, of great beauty; but these not only often lose their leaves, and even branches, from the first frost, but are frequently wholly destroyed, if it happen to be severe. They are low shrubs, very beautiful, and look well among perennial flowers, where they will not only class as to size with many of that sort, but, being rather tender, may with them have such extraordinary care as the owner may think proper to allow them. The propagation of the above sorts is very easy, and is accomplished either by layers or cuttings. 1. If a little earth be thrown upon the branches any time in the winter, they will strike root and be good plants by the autumn following, fit for any place. Thus easy is the culture by that method. 2. The cuttings will also grow, if planted any time of the year. Those planted in winter should be the woody shoots of the former summer: these may be set close in a shady border; and, being watered in dry weather, will often grow. This shrub may be propagated by young slips also, in any of the summer months. These should be planted in a shady border, like sage, and well watered. If the border is not naturally shady, the beds must be hooped, and covered with matting in hot weather. Watering must be constantly afforded them; and with this care and management many of them will grow.

PHLOX, the lychnidea, or bastard lychnis; a genus of the monogynia order, and pentandria class of plants, natural order twentieth, rotaceæ. There are seven species, all natives of North America. They have perennial roots, from which rise herbaceous stalks, from nine inches to two feet in height, adorned with tubulated flowers of a purple color. They are propagated by offsets, and will bear the winters in this country. They require a moist, rich soil, in which they thrive better, and grow faster than in any other.

PHLYCTENÆ, in medicine, small eruptions on the skin.

PHOBETOR, from φοβεω, to terrify, in mythology, one of the sons of Somnus, and his prime minister. His office was to terrify men during sleep, by appearing to them in the form of a wild beast or serpent.—Ovid. Met. xi. 640.

PHOCA, in zoology, a genus of quadrupeds of the order feræ. There are six sharp-pointed fore-teeth in the upper jaw, the two outermost being larger; and four blunt, parallel, distinct, equal fore teeth in the under jaw. There is but one dog-tooth, and five or six three-pointed grinders; and the hind legs are united so as to resemble a sheep's tail; are stretched much backwards, and bound together. Mr. Kerr enumerates nineteen species, and five varieties.

1. P. Australis, the Falkland seal, has short pointed external ears, and inhabits the Falkland Isles. The color is cinereous; the hairs tipt with a dirty white; the nose is short, and beset with strong black bristles; the fore feet have no claws; the hind paws have four long claws. The animal measures four feet.

2. P. barbata, the great seal, has long white whiskers with curled points. The back is arched, black, very deciduous, and very thinly dispersed over a thick skin, which is almost naked in summer. The teeth of this species are like those of the common seal (No. 18); the fore feet are like the human hand, the middle toe being the longest, and the thumb short. They are upwards of twelve feet long. The Greenlanders cut out of the skin of this species thongs and lines, a finger thick, for the seal fishery. Its flesh is as white as veal, and is esteemed the most delicate of any. They produce plenty of lard, but very little oil. The skins of the young are sometimes used to lie on. They inhabit the high sea about Greenland, are very timid, and commonly rest on the floating ice. The females breed about March, and bring forth each a single young one on the ice, generally among the islands. The old ones swim very slowly. On the north coast of Scotland is found a species twelve feet long. A young one, seven feet and a half long, was shown in London some years ago, which was so far from maturity as to have scarcely any teeth: yet the common seals have them complete before they attain the size of six feet, their utmost growth. One of this species, larger than an ox, was found in the Kamtschatkan seas, from 56° to 64° lat. N., called by the natives lach-tak. They weighed 800lbs. and were eaten by Behring's crew; but their flesh was loathsome. The cubs are entirely black.

3. P. Chilensis, the Chilese seal, has a longish snout, external ears, and five toes to each foot. It inhabits the coasts of Chili and Juan Fernandez.

4. P. cristata, the klapmus, or hooded seal of Pennant, has a crest on the fore part of the head; the body is of a gray color, having a thick coat of black wool, interspersed with white hairs. It is a large animal, and has a strong folded skin on its forehead, falling over its eyes and nose. This species inhabits the south coast of Greenland, west of Iceland and Newfoundland.

5. P. fasciata, the harnessed seal, or ribbon seal of Pennant, is of a blackish color, and marked with yellow stripes resembling harness across the neck, along the sides, and haunches. They inhabit the Kurile Isles.

6. i. P. grœnlandica, the swartside, of Erxleben, the attarsoak of Crautz, or harp seal of Pennant, has a smooth head, no external ears, the body gray, with a black semilunar mark on the side. Both fore and hind paws have distinct nails; the head is black and pointed; the tail short and horizontal. The animal is nine feet long. They inhabit Greenland, Newfoundland, Iceland, the Whale Sea, the Frozen Ocean and Kamtschatka. The skin is good and the oil much valued.

ii. P. groenlandica nigra, the bedlemer, is a blackish variety of the above.

7. i. P. hespida, or P. fœtida, the neitsek, or rough seal, is distinguished by a short nose and short round head; a body almost elliptical, covered with lard almost to the hind feet. This

species seldom exceeds four feet in length. Their hairs are closely set together, soft, long, and somewhat erect, intermixed with curls. They are of a dusky color; mixed with white, which sometimes varies to white, with a dusky dorsal line. They never frequent the high seas, but keep on the fixed ice in the remote bays near the frozen land; and, when old, never forsake their haunts. They couple in June, and bring forth in January on the ice. In that cold situation they have a hole for fishing; near which they generally remain solitary, being rarely found in pairs. They often sleep on the surface of the water, and thus become an easy prey to the eagle. They feed on small fish, shrimps, &c. The skin, tendons, and lard, are used in the same way with those of other seals. The flesh is red and fœtid, especially in males, which is nauseated even by the Greenlanders.

ii. P. hispida quadrata, or Newfoundland seal, is a larger variety of the above, called by the seal-hunters in Newfoundland, the square phipper. It weighs 500 lbs. Its coat is like that of a water-dog; so that it appears by the length of its hair to be allied to this species; but the vast difference in size admits not of that decision.

8. P. jubata, the maned seal of Schreber, or leonine seal of Pennant, inhabits the coast of the North Pacific Ocean, west coast of America, Falkland Islands, Patagonia, Kamtschatka, and the Kurile Isles. The color is reddish; the males are sometimes twenty-five feet long, weigh 15 or 1600 lbs., and have a long flowing mane on their necks. Their voice is like that of a bull; the head is large; nose short and turned up; with large strong whiskers; the eyes are large; the fore feet black, resembling fins, without toes; the hind feet very broad, with small nails, and very short tails. They live in families, each male having many females, about which they often quarrel and fight.

9. P. laniger, or phoca leporina, the leporine seal of Pennant, has hair of a dirty white color, tinged with yellow, but never spotted. The hairs are erect, interwoven, and soft like those of a hare, especially in those of the young. The head is long, the upper lip swelling and thick; the whiskers very strong and very thick, ranged in fifteen rows, covering the whole front of the lip, so that it appears bearded; the eyes are blue, and the pupil black; the teeth are strong; the fore-feet short; the membranes of the hind feet even and not waved; the tail is short and thick, it being four inches two lines in length; the cubs are of a milk-white color. The length of this species is about six feet six inches, and the circumference where greatest five feet two. This species inhabit the White Sea in the summer time, and ascend and descend the rivers with the tide in quest of prey. They are likewise found on the coast of Iceland, and within the polar circle from Spitzbergen to Tchutki Noss, and thence south about Kamtschatka.

10. P. leonina, the sea-lion of Anson, the sea-wolf of Pernetty, or the bottle-nose of Pennant, is found near the south pole. One variety of this species is described at some length by the publisher of Anson's voyage. Of these we have the following account in Pernetty's Historical Journal:—'The hair that covers the back part of the head, neck, and shoulders, is at least as long as the hair of a goat. It gives this amphibious animal an air of resemblance to the common lion of the forest, excepting the difference of size. These sea-lions are twenty-five feet in length, and from nineteen to twenty in circumference. Those of the small kind have a head resembling a mastiff's with close cropt ears. The teeth of those which have manes are much larger and more solid than those of the rest. In these all the teeth in the jaw-bone are hollow. They have only four large ones, two in the lower and two in the upper jaw. The rest are not even so large as those of a horse. They inhabit the coasts of Chili, New Zealand, Juan Fernandez, Falkland Isles, and New Georgia. These sea-lions that have manes are not more mischievous or formidable than the others. They are equally unwieldy and heavy in their motions; and are rather disposed to avoid than to fall upon those who attack them. Both kinds live upon fish and water fowls, which they catch by surprise. They bring forth and suckle their young ones among the corn flags, where they retire at night, and continue to give them suck till they are large enough to go to sea. In the evening they assemble in herds upon the shore, and call their dams in cries so much like lambs, calves, and goats, that, unless apprised of it, one would easily be deceived. The tongues of these animals are very good eating. The oil which is extracted from their grease is of great use. It is preferred to that of the whale; it is always clear, and leaves no sediment. The skins of the sea-lions are chiefly used in making portmanteaus, and in covering trunks. When they are tanned they have a grain almost like Morocco. They are not so fine, but are less liable to tear, and keep fresh a longer time. They make good shoes and boots, which, when well seasoned, are water-proof.

11. P. maculata, the spotted seal of Pennant, inhabits the Kurile Isles, and the seas of Kamtschatka. The body is spotted with brown.

12. P. monachus, the hooded seal, or Mediterranean seal of Pennant, inhabits chiefly the coast of Dalmatia. It has no external ears; only four cutting teeth in each jaw; the fore paws are not divided; the hinder paws have no nails. The skin of it folds like a monk's hood, whence the names. The body is eight feet seven inches long, and five feet round.

13. P. mutica, the long-necked seal of Pennant, has a slender body, and no claws on the fore feet, which resemble fins.

14. P. nigra, the black seal of Pennant, has a peculiar, but undescribed, conformation of the hind legs. They inhabit the coast of the Kurile Isles.

15. P. punctata, the speckled seal of Pennant, is elegantly speckled all over the body, head, and limbs. They inhabit the seas of Kamtschatka and the Kurile Isles.

16. P. pusilla, the little seal of Schreber, Pennant, and Buffon; the φωκη of Aristotle; the vitulus marinus of Pliny, and the sea-calf of Dampier; has a smooth head, and the rudiments of external ears; the body is brown, and measures two feet two inches.

17. P. testudo, the tortoise-headed seal of Pennant, has a head like that of a tortoise, a slender neck, and feet like those of the common seal. It is found on the coasts of many places of Europe.

18. i. P. vitulina, the sea-calf, or common seal, inhabits the European ocean. It has a smooth head, without external ears; and the common length is from five to six feet. The fore legs are deeply immersed in the skin of the body. The hind legs are placed in such a manner as to point directly backwards; every foot has five toes, connected by a strong and broad web, covered on both sides with short hair. The toes are furnished with strong claws, well adapted for climbing the rocks; the claws on the hind feet are slender and straight; but at the ends a little incurvated. The head and nose are broad and flat, like those of the otter; the neck short and thick; the eyes large and black; in lieu of external ears, it has two small orifices; the nostrils are oblong; on each side the nose are several long stiff hairs; and above each eye are a few of the same kind. The form of the tongue is very singular, being forked or slit at the end. The cutting teeth are six in the upper jaw, and only four in the lower. It has two canine teeth above and below, and on each side of the jaw are five grinders; in all thirty-four. The whole body is covered with short hair, very closely set together: the color of that on the body is generally dusky, spotted irregularly with white; on the belly white; but seals vary greatly in their colors: some have been found entirely white. The seal is common on most of the rocky shores of Great Britain and Ireland, especially on the north coasts. In Wales it frequents the coasts of Caernarvonshire and Anglesey. They inhabit all the European seas, even to the extreme north; are found far within the arctic circle, in the seas both of Europe and Asia, and even those of Kamtschatka. They prey entirely on fish, and never molest the sea-fowls; for numbers of each are often seen floating on the waves, as if in company. Seals eat their prey beneath the water; and, when devouring any very oily fish, the place is known by the smoothness of the waves immediately above. They are excellent swimmers, ready divers, and very bold when in the sea, swimming carelessly about boats. Their dens are in caverns near the sea, but out of the reach of the tide; in summer they will come out of the water, to bask in the sun on large rocks; and that is the opportunity our countrymen take of shooting them: if they chance to escape, they hasten towards their proper element, flinging stones and dirt behind them as they scramble along: and expressing their fears by piteous moans; but, if they be overtaken, they will make a vigorous defence with their feet and teeth till they are killed. They are taken for the sake of their skins, and for the oil their fat yields.

The flesh of these animals, and even of porpoises, formerly found a place at the tables of the great, as appears from the bill of fare of the vast feast that archbishop Nevill gave in the reign of Edward IV. They couple about April, on small islands near the shore; and bring forth in those vast caverns that are numerous on our coasts: they commonly bring two at a time, which in their infant state are covered with a whitish down or woolly substance. In October and November the seal-hunters of Caithness enter the mouths of the caverns about midnight, and, rowing in as far as they can, land; each of them being provided with a bludgeon, and properly stationed; they now light their torches, and make a great noise, which brings down the seals from the further end, in a confused body, with fearful noise and cries: at first the men are obliged to give way for fear of being overborne; but when the first crowd is past, they kill as many as straggle behind, chiefly the young, by striking them on the nose, where a very slight blow despatches them. Seals are seen in the greatest plenty on the shores of Cornwall, in May, June, and July. Their heads in swimming are always above water. They sleep on rocks surrounded by the sea, or on the less accessible parts of our cliffs left dry by the ebb of the tide; and, if disturbed by any thing, take care to tumble over the rocks into the sea. They are extremely watchful, and never sleep long without moving; then raise their heads, and lie down again, and so on, raising their heads and reclining them alternately in about a minute. They use this precaution, as being not provided with external ears; and consequently not hearing very quick, nor from any great distance. These animals are so very useful to the inhabitants of Greenland, and other arctic people, that they may be called their flocks. 'Seals,' says Crantz, 'are more needful to them than sheep are to us, though they furnish us with food and raiment; or than the cocoa-tree is to the Indians. The seal's flesh, with that of the reindeer, supplies the natives with their most substantial food. Their fat furnishes them with oil for lamp-light, chamber, and kitchen fire. They also mollify their dry food, mostly fish, in the train; and they barter it for all kinds of necessaries with the factor. They can sew better with the fibres of the seal's sinews than with thread or silk. Of the skins of the entrails they make their windows, curtains for their tents, shirts, and part of the bladders they use at their harpoons: and they make train bottles of the maw. Formerly, for want of iron, they made all manner of instruments and working tools of their bones. Neither is the blood wasted, but boiled with other ingredients, and eaten as soup. Of the skin of the seal they stand in the greatest need; as they cover over with it their boats in which they seek their provisions. They also cut their straps out of them, and cover their tents with them; without which they could not subsist in summer. This is their chief business and labor from their childhood. The Greenlanders have four ways of catching seals: either singly, with the bladder; or in company, by the clapper-hunt; or in winter on the ice; or by shooting them with a gun. The principal and most common way is the taking them with a bladder. When the Greenlander sets out equipped, and spies a seal, he tries to surprise and strike it with his harpoon. The moment the seal is pierced, the Greenlander must throw the bladder, tied to the end of the string, into the water, on the same side as the seal runs and dives; for that he does instantly like a dart. The seal often drags the bladder under water, but so wearies itself with it, that it must come up again in fifteen minutes to breathe. The Greenlander hastens to the spot, smites the seal with a long lance, and kills it, but stops the wound directly to preserve the blood; and, lastly, he blows it up like a bladder, to make it swim after him, fastened to the left side of his boat. In this exercise the Greenlander is exposed to the most imminent danger of his life, which is probably the reason that they call this hunt or fishery kamavock, i. e. the extinction, viz. of life. For if the line should entangle itself, or catch hold of the kajak or boat, or twine round the oar, hand, or neck, or if the seal should turn suddenly to the other side of the boat, the kajak must be overturned by the string, and drawn down under water. Nay, sometimes the seal will bite him in the face or hand, or bite a hole in his kajak, so that he must sink. Several in company must pursue the cautious kassigiak by the clapper-hunt. In the same manner they also surround and kill the attersoak in great numbers at certain seasons of the year, for in autumn they retire into the creeks or inlets in stormy weather, as in the Nepiset Sound in Ball's River, between the main land and the island Kangek, which is full two leagues long, but very narrow. There the Greenlanders cut off their retreat, and frighten them under water by shouting, clapping, and throwing stones; but, as they must come up again to draw breath, they kill them with darts. This is a very profitable diversion for the Greenlanders, for often one man will have eight or ten seals for his share. The third method of killing seals upon the ice is mostly practised in Disko, where the bays are frozen over in the winter. The seals make sometimes holes in the ice, where they breathe; near such a hole a Greenlander places himself, and, when the seal puts his nose to the hole, he pierces it instantly with his harpoon; then breaks the hole larger, draws it out, and kills it.'

ii. P. vitulina Bothnica is a variety differing in having a broader nose, longer nails, and a darker color. They inhabit the Gulf of Bothnia.

iii. P. vitulina Caspica, the Caspian seal, is of a mixed color, and inhabits the Caspian Sea.

iv. P. vitulina Siberica, the Siberian seal, is of a silver white color, and inhabits the lakes Baikal and Orom, in Siberia.

19. P. ursina, the sea bear, or ursine seal, has external ears. The male is greatly superior in size to the female. The bodies of each are of a conic form, very thick before, and taper to the tail. The length of a large one is eight feet; the greatest circumference five feet; near the tail twenty inches; and the weight is about 800 lbs. The nose projects like that of a pug-dog, but the head rises suddenly; the teeth lock into one another when the mouth is shut; the tongue is large; the eyes are large and prominent, and may be covered at pleasure by a fleshy membrane. The length of the fore legs is twenty-four inches; they are like those of other quadrupeds, not immersed in the body like those of seals; the feet are formed with toes like those of other animals, but are covered with a naked skin, so that externally they seem to be a shapeless mass; the hind legs are fixed to the body quite behind, like those of common seals; but are capable of being brought forward, so that the animal makes use of them to scratch its head. These animals are found in the northern seas, and in amazing quantities between Kamtschatka and America; but are scarcely known to land on the Asiatic shore: nor are they ever taken, except in the three Kurilian Islands; and thence in the Bobrowoie More, or Beaver Sea, as far as the Kronski headland, off the river Kamtschatka, which comprehends only from 50° to 56° lat. N. It is observable that they never double the southern cape of the peninsula, or are found on the western side in the Penschinska Sea; but their great resort has been observed to be to Bhering's Islands. They are regularly migratory. They first appear off the three Kurile Islands and Kamtschatka in the earliest spring. There is not one female which does not come pregnant. Such as are then taken are opened, the young taken out and skinned. They are found in Bhering's Island only on the western shore, being the part opposite to Asia, where they first appear on their migration from the south. Ursine seals are also found in the southern hemisphere, from under the line in the isle of Gallipagos, to New Georgia, in lat. 54° 15′ S., and long. 37° 15′ W. In the intermediate parts they are met with in New Zealand, in the isle of Juan Fernandez, and Massa Fuera, and along the coasts of Chili to Terra del Fuego and Staten Land. In Juan Fernandez, Staten Land, and New Georgia, they swarm; as they do at the northern extremity of this vast ocean. Those of the southern hemisphere also migrate. Alexander Selkirk, who passed four lonely years on the isle of Juan Fernandez, remarked that they come ashore in June, and stay till September. Captain Cook found them again in their place of emigration in equal abundance, on Staten Land and New Georgia, in December and January; and Don Pernetty found them on the Falkland Islands in February. According to the Greenlanders, this species inhabit the southern parts of their country. They call it auvekejak, and say it is very fierce, and tears to pieces whatsoever it meets; that it lives on land as well as in water, and is greatly dreaded by the hunters. During the three months of summer they lead a most indolent life; they arrive at the islands vastly fat; but during that time they are scarcely ever in motion, confine themselves for whole weeks to one spot, sleep a great part of the time, eat nothing, and, except the employment the females have in suckling their young, are totally inactive. They live in families: each male has from eight to fifty females, whom he guards with the jealousy of an eastern monarch; and, though they lie by thousands on the shores, each family keeps itself separate from the rest, and sometimes, with the young and unmarried ones, amount to 120. The males are very irascible, and often fight about the females. They swim very swiftly, at the rate of seven miles an hour. If wounded, they will seize on the boat, and carry it along with vast impetuosity, and oftentimes sink it. They can continue a long time under water. When they want to climb

the rocks, they fasten with their fore paws, and draw themselves up. They are very tenacious of life, and will live for a fortnight after receiving such wounds as would immediately destroy any other animal. The Kamtschatkans take them by harpooning, for they never land on their shore. To the harpoon is fastened a long line, by which they draw the animal to the boat after it is spent with fatigue; but, in the chace, the hunters are afraid of too near an approach, lest the animal should fasten on and sink their vessel. Their emigration is in September, when they depart excessively lean, and take their young with them. On their return they generally frequent the same places which they did in the spring. Their winter retreats are unknown; but are supposed to be the islands between Kurili and Japan, called Campagna Land, Staten Land, Jeso Gasima, and which were discovered by Martin Uriel in 1642. They arrive along the shores of the Kurile Islands, and part of those of Kamtschatka, from the south. They inhabit only the west side of Bhering's Isle which faces Kamtschatka; and, when they return in September, their route is due south, pointing towards the discoveries of Uriel.

PHOCÆA, the last town of Ionia, and of Æolis, because situated on the right or north side of the Hermus, which he makes the boundary of Æolis to the south (Mela, Plin. Ptol.). It stood far in the land, on a bay or arm of the sea; had two very safe harbours, the one called Lampter, the other Naustathmos (Livy). It was a colony of Ionians, situated in the territory of Æolis (Herod). Massilia in Gaul was a colony from it. It was one of the twelve cities which assembled in the Panionium, or general council of Ionia. Some writers tell us that, while the foundations of this city were laying, there appeared near the shore a great shoal of sea-calves; whence it was called Phocæa, from φωκη, a sea-calf. Ptolemy, who makes the Hermus the boundary between Æolia and Ionia, places Phocæa in Æolis; but all other geographers reckon it among the cities of Ionia. It stood on the sea-coast, between Cuma on the north, and Smyrna on the south, near Hermus; and was anciently one of the most wealthy and powerful cities of all Asia; but is now a poor village, though the see of a bishop.

The Phocæans were expert mariners, and the first among the Greeks that undertook long voyages; which they performed in galleys of fifty oars. As they applied themselves to trade and navigation, they became acquainted pretty early with the coasts and islands of Europe, where they are said to have founded several cities, viz. Velia, in Italy; Alalia, or Aleria, in Corsica; and Massilia (now Marseilles), in Gaul. Neither were they unacquainted with Spain; for Herodotus tells us that, in the time of Cyrus the Great, the Phocæans arriving at Sartessus, a city in the Bay of Cadiz, were treated with extraordinary kindness by Argathonius king of that country, who, hearing that they were under apprehension of the growing power of Cyrus, invited them to settle in his kingdom. The Phocæans could not be prevailed upon to forsake their country; but accepted a large sum of money, which that prince generously gave them, to defray the expense of building a strong wall round their city. This wall they built on their return; but it was unable to resist the power of Cyrus, whose general, Harpagus, investing the city with a numerous army, soon reduced it to the utmost extremities. The Phocæans offered to capitulate, but, the conditions offered by Harpagus seeming severe, they begged he would allow them three days to deliberate, and, in the mean time, withdraw his forces. Harpagus complied with their request, and the Phocæans put their wives, children, and most valuable effects on board several vessels, and conveyed them to the island of Chios. Their design was to purchase the Œnessian islands, which belonged to the Chians, and settle there. But the Chians, jealous of losing their trade, refused: so they put to sea again, and having taken Phocæa by surprise, put all the Persians in it to the sword. They next went to Corsica, but great part of them returned very soon. They then lived in subjection either to the Persians, or tyrants of their own. Among the latter we find mention made of Laodamus, who attended Darius Hystaspis in his expedition against the Scythians; and of Dionysius, who, joining Aristagoras, tyrant of Miletus, and chief author of the Ionian rebellion, retired, after the defeat of his countrymen, to Phœnicia, where he made an immense booty, seizing on all the ships he met with trading to that country. From Phœnicia he sailed to Sicily, where he committed great depredations on the Carthaginians and Tuscans; but is said never to have molested the Greeks. In the Roman times the city of Phocæa sided with Antiochus the Great; whereupon it was besieged, taken, and plundered, by the Roman general, but allowed to be governed by its own laws. In the war which Aristonicus, brother to Attalus, king of Pergamus, raised against the Romans, they assisted the former to the utmost of their power; which so highly displeased the senate that they commanded the town to be demolished, and the whole race of the Phocæans to be exterminated. But the Massilienses interposed, and, with difficulty, assuaged the anger of the senate. Pompey declared Phocæa a free city, and restored the inhabitants to all their privileges; whence, under the first emperors, it was reckoned one of the most flourishing cities of all Asia Minor. It is now called Fochia.

PHOCAICUS, a name given to Marcellus. Lucan.

PHOCAS, a Roman centurion, who was made emperor by the army, and crowned at Constantinople about A. D. 603. The emperor Mauritius deserted, fled to Chalcedon with his five children, whom Phocas caused to be inhumanly murdered before his eyes, and then he murdered Mauritius himself, his brother, and several others who were attached to him. Phocas now sent his own image, and that of his wife Leontia, to Rome. Gregory the Great, then bishop of Rome, caused the images to be lodged in the oratory of the martyr Cæsarius, and wrote congratulatory letters to the usurper. As soon as the murder of Mauritius was known, however, Narses, who commanded the troops on the frontiers of Persia, revolted. Yet Phocas managed matters so as to gain him over to his interest, and then treacherously burnt him alive. By his cruelty Phocas soon became generally hated; for he spared neither sex nor age; amongst others he murdered Constantina the widow of Mauritius, and her daughters. In 609 a conspiracy was formed against him, but was discovered, and the persons concerned in it put to death. In 610, however, he was overtaken by the fate he had so long deserved. Heraclius, the son of Heraclius governor of Africa, being acknowledged as emperor by the people of Africa, sailed thence with a formidable fleet, and a powerful army, for Constantinople, where he defeated the tyrant's fleet. Phocas took refuge in the palace; but one Photinus, whose wife he had debauched, pursuing him, forced the gates, dragged the cowardly emperor from the throne, and having stripped him of the imperial robes, and clothed him with a black vest, carried him in chains to Heraclius, who commanded his hands and feet, then his arms, and at last his head, to be cut off; his body was then delivered to the soldiers, who burnt it in the forum. Such was the end of this cruel tyrant, after he had reigned seven years and some months.

PHOCENIC Acid, in chemistry, according to M. Chevreul, the principle of the soap of the dolphin oils. Its specific gravity is 0·932; it is colorless, and takes 100 parts of water to dissolve 5·5 parts of it. It is soluble in alcohol in every proportion. Its constituents are in vol. 3 of oxygen; 10 of carbon; and 14 of hydrogen. 100 of phocenic acid neutralise 82·77 of barytes, forming a salt soluble in its own weight of water at 68° of Fahrenheit. The smell of leather dressed with fish oil is ascribed to the decomposition of this acid with the oil.

PHOCIUM, in architecture, the name of an edifice in which were held assemblies of the deputies from all the Phocæan towns. It was situated near the city of Daulis in Phocis. Pausanias gives a description of this building in the fifth chapter of his tenth book. It was a vast structure, the two longest sides of which were ornamented interiorly with porticoes, which served to support the roof as well as to embellish the building. Under these porticoes were benches elevated a little above the level of the floor, and destined for the accommodation of the deputies. The side immediately fronting the entrance was adorned with statues of Jupiter, Juno, and Minerva; the former seated on his throne, the two latter each on one side of him.

PHOCICUM Bellum, the Phocian or sacred war carried on by the Thebans and Philip II. against the Phocians, for plundering the temple of Apollo at Delphi. See Macedon and Phocis.

PHOCION, a distinguished Athenian general and orator in the time of Philip II. of Macedon. He was too modest to solicit command, though, either as a soldier, orator, statesman, or general, he was by far the most eminent Athenian of his time. As a most disinterested patriot, he could entertain no affection for Philip; but as he knew the disposition of his countrymen, and how unlikely they were to support measures necessary to humble the Macedonian power, he chose rather to cultivate the esteem which Philip showed for the state of Athens, as a means of preserving her, when she should be reduced to that situation which he conceived they wanted virtue to prevent. See Macedon. He was, however, appointed to command the army which was sent to assist the Byzantines against Philip, whom he obliged to return to his own dominions. This truly great man, whom (though extremely poor) no sum offered by Philip or Alexander could bribe to betray his country, and who on all occasions gave them sound advice, was at length accused by his ungrateful countrymen. He was sent to Athens by Polyperchon, head of a faction in Macedonia, with his friends, chained, in carts, with this message, 'That though he was convinced they were traitors, yet he left them to be judged by the Athenians as a free people.' This happened A. A. C. 318. They were all in a summary manner condemned to death, viz. Phocion, Nicocles, Aheudippus, Agamon, and Pythocles, who were present: Demetrius Phalereus, Callimedon, Charicles, and others, were condemned in their absence. The spleen of his enemies was not extinguished with his life; they decreed that his corpse should be banished the Athenian territories. When the Athenians, however, began to cool, and remember the many services they had received from Phocion, they decreed him a statue of brass, ordered his bones to be brought back at the public expense, and decreed that his accusers should be put to death.

PHOCIS, a country of Greece, between Bœotia on the east, and Locris on the west, extending from the Sinus Corinthiacus on the south, to the sea of Eubœa on the north; and, according to Dionysius, as far as Thermopylæ; but reduced afterwards to narrower bounds (Demost. Strab. Paus.). Its greatest length was from north to south between 38° 45′ and 39° 20′, about thirty-five miles; but not extending thirty miles from east to west, i. e. from 23° 10′ to 23° 40′ at the widest, but about twenty-three miles towards the Corinthian bay, and much narrower still towards the north. It was named from Phocus the son of Ornytion, a native of Corinth; but was soon after invaded by the Æginetæ, under Phocus, the son of Æacus king of Ægina. In Phocis there were many celebrated mountains, particularly Cythæron, Helicon, and Parnassus. Cythæron was consecrated to the Muses, as well as these, and was equally celebrated by the poets. The chief river was the Cephisus, running from the foot of Parnassus, northward, and falling into the Pindus, near the boundary of that kingdom. It had several considerable cities: such as Cyrra, Crissa, and Antecyra, which, according to Ptolemy, were on the sea coasts; and Pythia, Delphia, Daulis, Elatia, Ergosthenia, and Baulia, which were inland towns. Elatia was the largest and richest after Delphi. Daulis was remarkable for the stature and prowess of its inhabitants; and for the tragical events said to have happened in it. See Philomela. Deucalion was king of that part of Phocis which lies about Parnassus at the time that Cecrops I. flourished in Attica; but the Phocians afterwards formed themselves into a commonwealth, governed by general assemblies chosen from among themselves, and changed frequently. Of the history of the Phocians little is known till the time of the holy war, of which the following was the origin:—The Phocians having presumed to plough the territories of the city of Cyrra, consecrated to the Delphic god, were summoned by the other Grecian states before the court of the Amphictyons, where a considerable fine was imposed upon them for their sacrilege. They refused to pay it, and at the next assembly their dominions were adjudged confiscated to the use of the temple. This exasperated the Phocians still more; who, at the instigation of one Philomelus, seized upon the temple, plundered it of its treasure, and held the sacred depositum for a considerable time. This gave rise to the Phocian or holy war, wherein Athens, Sparta, and some others of the Peloponnesian states declared for the Phocians; and the Thebans, Thessalians, Locrians, and others, against them. The war being ended, the grand council assembled, and imposed an annual fine of sixty talents upon the Phocians, to be paid to the temple, and continued till they had fully repaired the damage it had sustained, and, till this reparation should be made, they were excluded from dwelling in walled towns, and from having any vote in the grand assembly. They did not, however, continue long under this heavy sentence: their known bravery made their assistance so necessary to the rest that they were glad to remit it; after which remission they continued to behave with their usual courage and resolution, and soon obliterated their former guilt.

PHOCUS, the name of three ancient Grecians: 1. The founder; and, 2. the first invader of Phocis; which last was the son of Æacus by Psamathe, one of the Nereids, and brother of Peleus and Telamon; who killed him: 3. The son of the celebrated Phocion, who avenged his father's death, but never did any other memorable action.

PHŒBE, in mythology, 1. A name of Diana: 2. A daughter of Leucippus, brother of Tyndarus, king of Sparta, by Philodice, the daughter of Inachus. She and her sister Hilaria, were betrothed to their cousins Lynceus and Idas but were carried off and married by their other cousins, Castor and Pollux.

PHŒBEUM, a town of Laconiar, near Sparta.

PHŒBIDAS, a Spartan general sent to assist the Macedonians against the Thracians. He seized the citadel of Thebes, for which act of perfidy the Spartans, instead of rewarding, disgraced and banished him, though they still retained the citadel. (C. Nepos.) He died A. A. C. 377.

PHŒBUS, one of the names given by ancient mythologists to the Sun, Sol, or Apollo. See Apollo.

PHŒMOS, a lake of Arcadia. Lempr.

PHŒNICE, an ancient town of Epirus. Livy, xxix. c. 12.

Phœnice, or Phœnicia, the ancient name of a country lying between 34° and 36° of N. lat.; bounded by Syria on the north and east, by Judea on the south, and by the Mediterranean on the west. Some derive the name from one Phœnix; others from φοινιξ, the palm or date, as these trees abounded in this country. Some suppose that Phœnice is originally a translation of the Hebrew word Edom, from the Edomites who fled thither in the days of David. By the contraction of Canaan it was also called Cana, and anciently Raabothin and Colpitis. The Jews commonly called it Canaan; though some part of it they knew by the name of Syrophœnice Bochart tells us that the most probable etymology is Phene Anak, i. e. 'the descendants of Anak.' Such were the names peculiar to this small country; though Phœnice was sometimes extended to all the maritime countries of Syria, Judea, and Canaan, to the Philistines, and even to the Amalekites. But these two names, and the rest, were most generally swallowed up by those of Palestine and Syria. There is some disagreement among authors with respect to the northern limits of this country. Ptolemy makes the river Eleutherus the boundary of Phœnice on the north; but Pliny, Mela, and Stephanus, place it in the island of Aradus, north of that river. Strabo observes that some will have the river Eleutherus to be the boundary of Seleucis, on the side of Phœnice and Cœlosyria. On the coast of Phœnice, and south of the Eleutherus, stood the following cities:—Simyra, Orthosia, Tripolis, Botrys, Byblus, Palæbyblus, Berytus, Sidon, Sarepta, Tyrus, Palætyrus. Phœnice extended, according to Ptolemy, even beyond mount Carmel; for that geographer places in Phœnice, not only Ecdippa and Ptolemais, but Sycaminum and Dæra, which stand south of that mountain. These however, properly speaking, belonged to Palestine. We will not attempt to mark out the bounds of the midland Phœnice. Ptolemy reckons in it the following towns:—Arca, Palæbyblus (Old Byblus), Gabala, and Cæsaria Paniæ. This province was considerably extended in the times of Christianity: when, being considered as a province of Syria, it included both Damascus and Palmyra. The soil is good, and productive of many necessaries for food and clothing. The air is wholesome and the climate agreeable. It is plentifully watered by small rivers; which, running down from mount Libanus, sometimes swell to an immoderate degree, either increased by the melting of the snows on that mountain, or by heavy rains. Upon these occasions they overflow, to the great danger and hinderance of the traveller and damage of the country. Among these rivers is that of Adonis.

Of their civil laws we have no system. With regard to religion, the Phœnicians were the most gross and abominable idolaters. Baal-berith, Baalzebub, Baalsamen, &c., mentioned in Scripture, were some of the Phœnician gods; as were also Moloch, Ashtaroth, and Thammuz. The chief deity was named Baal, or Baal-samen; whom the Hebrews called Baal-shemim, or the god of heaven. See Baal. Diodorus Siculus says, their chief deity was that of Carthage, Chronus, or Saturn. The sacrifices offered up to him were children of the best families. Our author also tells us that the Carthaginians had a brazen statue or colossus of this god, the hands of which were extended in act to receive, and bent downwards in such a manner, that the child laid thereon immediately fell down into a hollow where there was a fiery furnace. He adds, also, that this inhuman practice seemed to confirm a tradition handed down to the Greeks from very early antiquity, viz. that Saturn devoured his own children. The goddess Cœlestis, or Urania, was held in the highest veneration by the Carthaginians. She is thought to have been the same with the queen of heaven mentioned in Jeremiah, the Juno Olympia of the Greeks. Besides these, there were several other deities of later dates, who were worshipped among the Phœnicians, particularly those of Tyre, and consequently among the Carthaginians also. These were Jupiter, Apollo, Mars, and Bacchus. Jupiter was worshipped under the name of Belus or Baal. To him they addressed their oaths. The same name was also given to the other two, whence they were frequently mistaken for one another. Apollo, or the sun, went either by this name simply, or by others of which Baal made a part. Astarte, or Ashtaroth, was also a chief goddess of the Phœnicians. See ASHTAROTH, and POLYTHEISM. Herodotus supposes the Phœnicians to have been circumcised; but Josephus asserts that none of the nations included under the vague name of Palestine and Syria used that rite, the Jews excepted. They abstained, however, from the flesh of swine. Much is said of their arts, sciences, and manufactures; but in general terms only. The Sidonians, who were a branch of the Phœnicians, were of most happy genius. They were early addicted to philosophical exercises; insomuch that Moschus, a Sidonian, taught the doctrine of atoms before the Trojan war: and Abomenus of Tyre puzzled Solomon by his questions.

Phœnice continued to be one of the seats of learning, and both Tyre and Sidon produced their philosophers of later ages; namely, Bœthus and Diodatus and Sidon, Antipater and Apollonius of Tyre, who gave an account of the writings and disciples of Zeno. As to their manufactures, the glass of Sidon, the purple of Tyre, and the exceedingly fine linen they wove, were the produce of their own country, and their own invention; and for their extraordinary skill in working metals, in hewing timber and stone; in a word, for their perfect knowledge of what was solid, great, and ornamental in architecture—we need only mention the large share they had in erecting and decorating the temple of Solomon at Jerusalem. Their fame for taste, design, and ingenious invention, was such, that whatever was elegant, great, or pleasing in apparel, vessels, or toys, was distinguished by the epithet of Sidonian. The Phœnicians were likewise celebrated as merchants, navigators, and planters of colonies in foreign parts. As merchants, they may be said to have engrossed all the commerce of the western world: as navigators, they were the boldest, the most experienced, and greatest discoverers of the ancient times: they had for many ages no rival. In planting colonies they exerted themselves so much, that, considering their habitation was little more than the slip of ground between Mount Libanus and the sea, it is surprising how they could furnish such supplies of people, and not wholly depopulate their own country. It is generally supposed that the Phœnicians were induced to deal in foreign commodities by their neighbourhood with the Syrians; and that, from their example, they turned their thought to trade and navigation, and by an uncommon application soon eclipsed their masters in that art. The whole thoughts of the Phœnicians were employed on schemes to advance their commerce. They affected no empire but that of the sea; and seemed to aim at nothing but the peaceable enjoyment of their trade. This they extended to all the known parts they could reach; to the British isles, commonly understood by the Cassiterides; to Spain and other places in the ocean, both within and without the Straits of Gibraltar; and, in general, to all the ports of the Mediterranean, the Black Sea, and the Lake Mæotis. In all these parts they had settlements and correspondents, from which they drew what was useful to themselves, or might be so to others; and thus they exercised the three great branches of trade; importation, exportation, and transportation. Such was their trade by sea; and for that which they carried on by land in Syria, Mesopotamia, Assyria, Babylonia, Persia, Arabia, and India, it was of no less extent, and may give us an idea of what this people once was, how rich, and how deservedly their merchants are mentioned in Scripture as equal to princes. Their country was at that time the great warehouse where every thing that might either administer to the necessities or luxury of mankind was to be found; which they distributed as they judged would be best for their own interest. As to their navigation, their larger embarkations were of two sorts; they divided them into round ships or gauli; and long ships, galleys, or triremes. When they drew up in line of battle, the gauli were disposed at a small distance from each other in the wings, or in the van and the rear; their triremes were contracted together in the centre. To discourage other nations from engaging in commerce, they practised piracy, and thus grasped at the whole commerce of the then known world. They also very early applied astronomy to navigation.

PHŒNICOPTERUS (probably from φοινιξ, red), the flamingo, in ornithology, a genus of birds belonging to the order of grallæ. The beak is naked, teethed, and bent as if it were broken; the nostrils are linear; the feet are palmated, and four-toed. There is but one species, viz.

P. Bahamensis of Catesby, a native of Africa and America. This species resembles the heron in shape, excepting the bill, which is of a very singular form. It is two years old before it arrives at its perfect color; and then it is entirely red, excepting the quill feathers, which are black. A full grown one is of equal weight with a wild duck; and when it stands erect it is five feet high. The feet are webbed. The flesh is delicate, and mostly resembles that of a partridge in taste. The tongue, above any other part, was in the highest esteem with the luxurious Romans.

Dat mihi rubens penna nomen, sed lingua gulosis
Nostra sapit. *Mart.* l. 13. epig. 66.

These birds make their nests on hillocks in shallow water; on which they sit with their legs extended down, like a man sitting on a stool. They breed on the coast of Cuba and the Bahama islands, and frequent salt water only. By the particular shape of its bill, this bird, in eating, twists its neck from side to side, and makes the upper mandible touch the ground. They are very stupid, and will not rise at the report of a gun; nor is it any warning to those who survive that they see others killed by their side; so that, by keeping himself out of sight, a fowler may kill as many as he pleases. In the old continent they are not often met with beyond lat. 40° N. or S. But they are found every where on the African coast and adjacent isles, to the Cape of Good Hope; and sometimes on the coast of Spain, Italy, and those of France, lying on the Mediterranean; at Marseilles, and for some way to the Rhone. In some seasons they frequent Aleppo and the parts adjacent. They are seen also on the Persian side of the Caspian Sea, and thence along the west coast as far as the Wolga; though this is at uncertain times, and chiefly in considerable flocks coming from the north-east mostly in October and November: but, so soon as the wind changes, they totally disappear. They breed in the Cape Verd Isles, particularly in that of Sal. They are also common in the warm parts of America, as Peru, Chili, Cayenne, Brasil, and the various islands of the West Indies. Sloane found them in Jamaica, at the Bahama Islands, and Cuba, where they breed. Their food chiefly consists of small fish or their eggs; and of water insects, which they search after, by plunging in the bill and part of the head. Whilst feeding, one of them is said to stand sentinel, and the moment he sounds the alarm, the whole flock takes wing. This bird, when at rest, stands on one leg, the other being drawn up close to the body, with the head placed under the wing on that side of the body it stands on. They are sometimes caught young, and are brought up tame; but are always impatient of cold; and seldom live in this state.

PHŒNICUSA, one of the Æolian Islands; now called Felicudi.

PHŒNIGMUS (from φοινιξ, red), in medicine, 1. A redness of the skin, such as is produced by stimulating substances. 2. That which reddens the skin when applied to it.

PHŒNISSA, a patronymic of Dido. Virg.

PHŒNIX, son of Amyntor, king of Argos, by Cleobule or Hippodamia, was preceptor to young Achilles. His father having proved faithless to his wife, through fondness for a concubine called Clytia, Cleobule persuaded her son Phœnix to ingratiate himself with his father's mistress. Phœnix easily succeeded; but Amyntor, discovering his intrigues, pronounced a curse upon him, and the son was soon after deprived of his sight by divine vengeance. Some say that Amyntor himself put out his son's eyes, which so provoked him that he meditated the death of his father. Piety, however, prevailed over passion; and, that he might not become a parricide, Phœnix fled from Argos to the court of Peleus, king of Phthia. Here he was treated with tenderness; Peleus carried him to Chiron, who restored him to his eye-sight; soon after which he was made preceptor to Achilles, his benefactor's son. He was also presented with the government of many cities. He went with his pupil to the Trojan war. After the death of Achilles, Phœnix, with others, was commissioned by the Greeks to return into Greece, to bring to the war young Pyrrhus. This commission he successfully performed; and, after the fall of Troy, he returned with Pyrrhus, and died in Thrace. He was buried, according to Strabo, near Trachinia, where a small river in the neighbourhood received the name of Phœnix.

PHŒNIX, the son of Agenor, by a nymph, who was called Telephassa, according to Apollodorus and Moschus, or, according to others, Epimidusa, Perimeda, or Agriope. He was, like his brother Cadmus, and Ciux, sent by his father in pursuit of his sister Europa, whom Jupiter under the form of a bull had carried away; and, when his enquiries proved unsuccessful, he settled in a country, which was from him called Phœnicia. From him also the Carthaginians were called Pœni.

PHŒNIX, in astronomy, one of the new southern constellations. See ASTRONOMY.

PHŒNIX, in botany, the great palm, or date tree; a genus of plants belonging to the order of palmæ. There is only one species, viz.

P. dactylifera, the date tree, a native of Africa and the eastern countries, where it grows to fifty, sixty, and 100 feet high. The trunk is round, upright, and studded with protuberances, which are the vestiges of the decayed leaves. From the top issues forth a cluster of leaves or branches eight or nine feet long, extending all round like an umbrella, and bending a little towards the earth. The bottom part produces a number of stalks like those of the middle, but seldom shooting so high as four or five feet. These stalks, says Adanson, diffuse the tree very considerably; so that, wherever it naturally grows in forests, it is extremely difficult to open a passage through its prickly leaves. The date tree was introduced into Jamaica soon after the conquest of the island by the Spaniards. There are, however, but few of them there at this time. The fruit is somewhat in the shape of an acorn. It is composed of a thin, light, and glossy membrane, rather pellucid and yellowish; which contains a fine pulpy fruit, which is firm, sweet, and somewhat vinous to the taste, esculent, and wholesome; within this is enclosed a solid, tough, and hard kernel, of a pale gray color on the outside, and finely marbled within like the nutmeg. For medicinal use dates are to be chosen large, full, fresh, yellow on the surface, soft and tender, not too much wrinkled; such as have a vinous taste, and do not rattle when shaken. They are produced in many parts of Europe, but never ripen perfectly there. The best are brought from Tunis; they are also very fine and good in Egypt, and in many parts of the east. Those of Spain and France look well; but are never perfectly ripe, and very subject to decay. They are preserved three different ways; some pressed and dry; others pressed more moderately, and again moistened with their own juice; and others not pressed at all, but moistened with the juice of other dates, as they are packed up, which is done in baskets or skins. Those preserved in this last way are much the best. Dates have always been esteemed moderately strengthening and astringent. Though the date tree grows every where indiscriminately on the northern coasts of Africa, it is not cultivated with care, except beyond Mount Atlas; because the heat is not sufficiently powerful along the coasts to bring the fruits to maturity. Still even here the date tree supplies the deficiency of corn to the inhabitants of these countries, and furnishes them with almost the whole of their subsistence. They have flocks of sheep; but, as they are not numerous, they preserve them rather for the sake of their wool than their flesh, which is very unwholesome food in countries that are excessively warm.

The date trees are planted without order, twelve feet distant from each other, near rivulets and streams. Forests of them may be seen here and there of several leagues in circumference; their extent depending upon the quantity of water which can be procured to water them. These forests are intermixed with orange, almond, and pomegranate trees, and with vines which twist round the trunks of the dates; the heat is strong enough to ripen the fruit, though they are never exposed to the sun. Care is taken to till the earth well, and to raise, in many cases, a circular border around the root of each tree, that the water may remain longer and in larger quantity. The trees are watered at all seasons, but more particularly during the heats of summer. In winter, new plantations are formed. For this purpose, those who cultivate them take shoots of those which produce the best dates, and plant them at a small distance one from the other. At the end of three or four years these shoots begin to bear fruit: but this is as yet dry, without sweetness, and even without kernels; they never reach the highest degree of perfection of which they are susceptible till they are about fifteen or twenty years old. These plants are, however, produced from the seeds taken out of the fruit, provided they are fresh. They should be sown in pots filled with light rich earth, and plunged into a moderate hot-bed of tanners' bark, which should be kept in a moderate temperature of heat, and frequently watered. When the plants are come up to a proper size, they should be each planted in a separate small pot, filled with the same light earth, and plunged into a hot-bed again, observing to refresh them with water, as also to let them have air in proportion to the warmth of the season and the bed in which they are placed. During the summer they should remain in the same hot-bed; but, in the beginning of August, they should have a great share of air to harden them against the approach of winter; for, if they are too much forced, they will be so tender as not to be preserved through the winter without much difficulty, especially if there is not a bark stove to keep them in. The soil in which these plants should be placed must be composed in the following manner; viz. half of light fresh earth taken from a pasture ground, the other half sea-sand and rotten dung, or tanners' bark in equal proportion; these should be carefully mixed, and laid in a heap three or four months at least before it is used; but should be often turned over to prevent the growth of weeds, and to sweeten the earth. The trees, however, which spring from seed, never produce so good dates as those that are raised from shoots; they being always poor and ill tasted. It is undoubtedly by force of cultivation, and after several generations, that they acquire a good quality. The date trees which have been originally sown grow rapidly, and bear fruit in the fourth or fifth year. Care is taken to cut the inferior branches of the date tree in proportion as they rise; and a piece of the root is always left, of some inches in length, which affords the easy means of climbing to the summit. These trees live a long time, according to the account of the Arabs; who say that, when they have attained to their full growth, no change is observed in them for the space of three generations.

The number of females which are cultivated is much superior to that of the males, because they are much more profitable. The sexual organs of the date tree grow upon different stalks, and these trees flower in April and May, when the Arabs cut the male branches to impregnate the females. For this purpose they make an incision in the trunk of each branch which they wish to produce fruit, and place in it a stalk of male flowers; without this precaution the date tree would produce only abortive fruit. In some cantons the male branches are only shaken over the female. This practice of impregnating the date tree is very ancient. Pliny describes it accurately in that part of his work where he treats of the palm. There is scarcely any part of the date tree which is not useful. The wood, though of a spongy texture, lasts such a number of years that the inhabitants of the country say it is incorruptible. They employ it for making beams and instruments of husbandry; it burns slowly, but the coals which result from its combustion are very strong, and produce a great heat. The Arabs strip the bark and fibrous parts from the young date trees, and eat the substance, which is in the centre; it is very nourishing, and has a sweet taste; it is known by the name of the marrow of the date tree. They eat also the leaves, when they are young and tender, with lemon juice; the old ones are laid out to dry, and are employed for making mats, and other works of the same kind, which are much used, and with which they carry on a considerable trade in the interior parts of the country. From the sides of the stumps of the branches which have been left arise a great number of delicate filaments, of which they make ropes, and which might serve to fabricate cloth. Of the fresh dates and sugar, says Hasselquist, the Egyptians make a conserve, which has a very pleasant taste. In Egypt they use the leaves as fly-flaps, for driving away the numerous insects which prove so troublesome in hot countries. The hard boughs are used for fences and other purposes of husbandry; the principal stem for building. The fruit, before it is ripe, is somewhat astringent; but, when thoroughly mature, is of the nature of the fig. The Senegal dates are shorter than those of Egypt, but much thicker in the pulp, which is said to have a sugary agreeable taste, superior to that of the best dates of the Levant. A white liquor, known by the name of milk, is drawn also from the date tree. To obtain it, all the branches are cut from the summit of one of these trees, and, after several incisions have been made in it, they are covered with leaves, in order that the heat of the sun may not dry it. The sap drops down into a vessel placed to receive it, at the bottom of a circular groove, made below the incisions. The milk of the date tree has a sweet and agreeable taste when it is new; it is very refreshing, and it is even given to sick people to drink, but it generally turns sour in twenty-four hours. Old trees are chosen for this operation, because the cutting of the branches, and the large quantity of sap which flows from them, greatly exhaust them, and often cause them to decay. The male flowers of the date tree are also useful. They are eaten when still tender, mixed up with a little lemon juice. They are reckoned to be very provocative: the odor which they exhale is probably the cause of this property being ascribed to them. These date trees are very lucrative to the inhabitants of the desert. Some of them produce twenty bunches of dates; but care is always taken to lop off a part of them, that those which remain may become larger; ten or twelve bunches only are left on the most vigorous trees. It is reckoned that a good tree produces, one year with another, about the value of ten or twelve shillings to the proprietor. A pretty considerable trade is carried on with dates in the interior part of the country, and large quantities of them are exported to France and Italy. The crop is gathered towards the end of November. When the bunches are taken from the tree, they are hung up in some very dry place, where they may be sheltered and secure from insects. Dates afford wholesome nourishment, and have a very agreeable taste when they are fresh. The Arabs eat them without seasoning. They dry and harden them in the sun, to reduce them to a kind of meal, which they lay up in store to supply themselves with food during the long journeys which they often undertake across their deserts. This simple food is sufficient to nourish them for a long time. The inhabitants of the Zaara procure also from their dates a kind of honey which is exceedingly sweet. For this purpose they choose those which have the softest pulp; and, having put them into a large jar with a hole in the bottom, they squeeze them by placing over them a weight of eight or ten pounds. The most fluid part of the substance, which drops through the hole, is what they call the honey of the date. Even the stones, though very hard, are not thrown away. They give them to their camels and sheep as food, after they have bruised them, or laid them to soften in water. The date, as well as other trees which are cultivated, exhibits great variety in its fruit, with respect to shape, size, quality, and even color. There are reckoned to be at least twenty different varieties. Dates are very liable to be pierced by worms, and they soon corrupt in moist or rainy weather.

Phœnix, in ornithology, a fabulous bird of antiquity. The ancients speak of this bird as single, or the only one of its kind; they describe it as of the size of an eagle; its head finely crested with a beautiful plumage, its neck covered with feathers of a gold color, and the rest of its body purple, only the tail white, and the eyes sparkling like stars; they say that it lives above 500 years in the wilderness; that when thus advanced in age, it builds itself a pile of sweet wood and aromatic gums, and fires it with the wafting of its wings, and thus burns itself; and that from its ashes arises a worm, which in time grows up to be a phœnix. Hence the Phœnicians gave the name of phœnix to the palm tree; because, when burnt down to the root, it rises again fairer than ever. In the sixth book of the Annals of Tacitus, sect. 28, it is observed that, in the year of Rome 787, the phœnix revisited Egypt; which occasioned among the learned much speculation. This bird is sacred to the sun. Of its longevity the accounts are various. The common persuasion is that it lives 500 years; though by some the period is extended to 1461. But Ausonius makes it no less than 69,984 years! Eidyl. 4. The several eras when the phœnix has been seen are fixed by tradition. The first was in the reign of Sesostris; the second in that of Amasis; and, in the period when Ptolemy III. was on the throne of Egypt, another phœnix directed its flight towards Heliopolis. When to these circumstances are added the brilliant appearance of the phœnix, and the tale that it makes frequent excursions with a load on its back, and that when, by having made the experiment through a long tract of air, it gains sufficient confidence in its own vigor, it takes up the body of its father and flies with it to the altar of the sun to be there consumed, it seems probable that the learned of Egypt had enveloped under this allegory the philosophy of comets.

Phœnix, a river in Trachina.

PHOLAS, a genus of insects belonging to the order of vermes testacea. The shell is double valved and divaricated; the cardo is turned backwards, and connected by a cartilage. There are six species, distinguished by the figures of their shells. The name pholas is derived from the Greek, and signifies something which lies hid. This name they derive from their property of making themselves holes in the earth, sand, wood, or stone, and living in them. The means of their getting there, however, is unknown. They must have penetrated these substances when very small; because the entrance of the hole in which the pholas lodges is always much less than the inner part of it, and indeed than the shell of the pholas itself. Hence some have supposed that they were batched in holes accidentally formed in stones, and that they naturally grew of such a shape as was necessary to fill the cavity. The holes in which the pholades lodge are usually twice as deep, at least, as the shells themselves are long. The openings of these holes are what betray the pholas being in the stone; but they are always very small in proportion to the size of the fish. There seems to be no progressive motion of any animal in nature so slow as that of the pholas; it is immersed in the hole, and has no movement except a small one towards the centre of the earth; and this is only proportioned to the growth of the animal. Its work is very difficult in its motion; but it has great time to perform it in, as it only moves downward, sinking itself deeper in the stone as it increases in bulk. That part by means of which it performs this is a fleshy substance placed near the lower extremity of the shell; it is of the shape of a lozenge, and is considerably large in proportion to the size of the animal; and, though it be of a soft substance, it is not to be wondered at that in so long a time it is able, by constant work, to burrow into a hard stone. How they perform this may be seen by taking one of them out of the stone, and placing it upon clay; for they will immediately get to work in bending and extending that part allotted to dig for them, and in a few hours they will bury themselves in the mud in as large a hole as they had taken many years to make in the stone. They find little resistance in so soft a substance; and the necessity of their hiding themselves evidently makes them hasten their work. The animal is lodged in the lower half of the hole in the stone, and the upper half is filled up by a pipe of a fleshy substance and conic figure, truncated at the end: this they usually extend to the orifice of the hole, and place on a level with the surface of the stone; but they seldom extend it any farther than this. The pipe, though it appears single, is in reality double, or at least it is composed of two parts separated by a membrane. The use of this pipe or proboscis is the same with that of the proboscis of other shell-fish, to take in sea-water into their bodies, and afterwards to throw it out again. In the middle of their bodies they have a small green vessel, the use of which has not yet been discovered. This, when plunged in spirit of wine, becomes of a purple color; but its color on linen will not become purple in the sun like that of the murex; and, even if it would, its quantity is too small to make it worth preserving.

The pholas is remarkable for its luminous quality, which was noticed by Pliny, who observes that it shines in the mouth of the person who eats it; if it touch his hands or clothes it makes them luminous; and that its light depends upon its moisture. Reaumur observes, that whereas other fishes give light when they tend to putrescence, this is more luminous in proportion to its being fresh; that when dried, its light will revive if it be moistened either with fresh or salt water, but that brandy immediately extinguishes it. He endeavoured to make this light permanent, but none of his schemes succeeded. The attention of the Bolognian academicians was engaged to this subject by M. F. Marsilius in 1724, who brought a number of these fishes, and the stones in which they were enclosed, to Bologna, on purpose for their examination. Boccarius observed, that though this fish ceased to shine when it became putrid, yet that in its most putrid state it would shine, and make the water in which it was immersed luminous when it was agitated. Galeatius and Montius found that wine or vinegar extinguished this light; that in common oil it continued some days, but in rectified spirit of wine or urine hardly a minute. To discover in what manner this light was affected by different degrees of heat, they made use of a Reaumur's thermometer, and found that water rendered luminous by these fishes increased in light till the heat arrived at 45°, but that it then became suddenly extinct, and could not be revived again. In the experiments of Beccarius, a solution of sea-salt increased the light of the luminous water; a solution of nitre did not increase it quite so much. Sal ammoniac diminished it a little, oil of tartar per deliquium nearly extinguished it, and the acids entirely. This water poured upon fresh calcined gypsum, rock crystal, ceruse, or sugar, became more luminous. He also tried the effects of it when poured upon various other substances, but there was nothing very remarkable in them. Afterwards, using luminous milk, he found that oil of vitriol extinguished the light, but that of tartar increased it. He had the curiosity to try how differently colored substances were affected by this kind of light; and having, for this purpose, dipped several ribands in it, the white came out the brightest, next to this was the yellow, and then the green; the other colors could hardly be perceived. It was not, however, any particular color, but only light, that was perceived in this case. He then dipped boards painted with the different colors, and also glass tubes filled with substances of different colors, in water rendered luminous by the fishes. In both these cases, the red was hardly visible, the yellow was the brightest, and the violet the dullest. But, on the boards, the blue was nearly equal to the yellow, and the green more languid; whereas in the glasses the blue was inferior to the green. Of all the liquors into which he put the pholades, milk was rendered the most luminous. A single pholas made seven ounces of milk so luminous that the faces of persons might be distinguished by it, and it looked as if transparent. Air appeared to be necessary to this light; for, when Beccarius put the luminous milk into glass tubes, no agitation would make it shine unless bubbles of air were mixed with it. Montius and Galeatius found, that, in an exhausted receiver, the pholas, lost its light, but the water was sometimes made more luminous; which they ascribed to the rising of bubbles of air through it. Beccarius, as well as Reaumur, tried many schemes to render the light of these pholades permanent. For this purpose he kneaded the juice into a kind of paste with flour, and found that it would give light when it was immersed in warm water; but it answered best to preserve the fish in honey. In any other method of preservation, the property of becoming luminous would not continue longer than six months, but in honey it had lasted above a year; and then it would, when plunged in warm water, give as much light as ever. See Barbut's Genera Verminum, p. 14, &c.

The Memoirs of the Academy of Sciences (Savans Etrang. tom. iii. p. 267) contain the observations of Godeheu de Riville on two minute marine animals, which Latreille regards as falling under the genus lynceus of Muller, one of the many generic branches of the Linnæan monoculus; but whose habits are so similar to those of the pholas that a description of them will be interesting here.

'Among the various phenomena,' says the author alluded to, 'of which the causes are still almost unknown, that starry brightness, which we so often perceive in the slightly agitated waters of the ocean, greatly merits the attention of those who have a taste for physics; but I have not yet read any thing satisfactory on the subject, as writers seem to have satisfied themselves rather with conjectural reasons, than by making experiments to ascertain the real origin of this natural phosphorus.' In a voyage made by our author to the East Indies, he was enabled to make the following observations:—'About nine in the evening of the 14th of July 1754, being in N. lat. 8° 47′, and E. long. 73°, from Paris, he was informed that the sea appeared like a sheet of fire. Every portion of its surface, when gently agitated, broke into a thousand stars. Each wave which coursed along the side of the vessel spread out a pure, shining, silvery light. The more distant swelling of the waters presented the appearance of a moving plain covered with snow and the wake of the vessel was of a clear and luminous white, sprinkled over with brilliant spots of azure light (azurés).

'Anxious,' he continues, 'to consider a spectacle, to me alike novel and interesting, I was struck by the light shed by certain small bodies, which frequently remained attached to the helm, when the sea for a moment retired; and, without listening to all that was said regarding the supposed cause of the phenomenon, I ordered a bucket of water to be drawn up, and filtered into a basin through a fine linen handkerchief. After this operation, I observed that the filtered water was no longer luminous, but that the handkerchief was covered with many brilliant points. Some of these I raised on the end of my finger, and found that they had a certain consistence as animal bodies; being thus exposed, they gradually lost their brightness, and as they resembled the eggs or spawn of fishes, in form and dimensions, I at first yielded to the belief, which was pressed upon me, that they actually were so. Being anxious to examine one in a clear light, and placed under a strong magnifying glass, I was surprised to observe a sensible movement in its interior. Being doubtful of what I saw, I turned it in many directions, placing it on my nail in the centre of a drop of water. But what was my surprise when I perceived it became surrounded by a brilliant fluid, perceptible to all those who were in the cabin, as well as to myself. On this I did not fail to pursue my observations, and, having drawn up a greater quantity of water, I caused it to be filtered as before, and immersed the handkerchief, which had served for that purpose, into a basin of the pure sea water. I then instantly perceived a considerable number of small insects swimming about with celerity, which, at first sight, bore a resemblance to those commonly called in France puces d'eau, or water-fleas. In spite of their agility, I succeeded in arresting one, by entangling it in a hair pencil, fixed against the sides of the goblet: this pressure, though slight, seemed too strong for so delicate a being, it suffered from it, and, notwithstanding the light of two candles, by which we were pursuing our examination, we could perceive issuing from its body a luminous and bluish colored liquid, of which the traces extended in the water to the distance of two or three lines. This accident did not induce me to leave my hold: I raised it up on the point of the pencil, and scarcely was it placed under the microscope, than it again shed forth a quantity of that cerulean liquid. I expected that so great an exertion would have weakened it extremely, but I had again the satisfaction to see it apparently full of life, and stirring about with vivacity.

'It was not in consequence of the examination of a single specimen that I ventured to give its figure under a variety of aspects. The abundance with which I was then surrounded, enabled me to sacrifice many, that I might be assured of all the parts of which they are composed; and I examined several which I found next day rather in a languishing state, but which a change of water reanimated. The brilliant liquid of which they have so ample a reservoir was not even altered; for, having left, during some time, attached to the pencil, one of those which I had destined for examination by the microscope, it spread out a brightness which lasted seven or eight minutes, and was visible, even in full day, to various persons, at the distance of several feet.'

Many of the most lively specimens of these animals having been put into fresh water, very clear, and freed from all disagreeable intermixture, they were immediately precipitated to the bottom, became strongly agitated or convulsed, and died in about six seconds. Many of them, while expiring, gave out a quantity of their bright phosphoric fluid. It seemed absolutely necessary, in order that the insect might exert this power, that it should be in a state of humidity. When the moisture was absorbed, none shone even when bruised. Those which Godeheu had withdrawn from the sea, and placed in the same water in which he had found them, died one after another; but the water in which they had been preserved shone with a very lively light. A phosphoric matter, collected in consequence of this observation, did not, however, last for any time. Three days were sufficient to make it lose its luminous property.

This little animal appeared to be enclosed in, or protected by, a scaly covering, or shell. Its general contour might be said to resemble an almond split down one side, and a little sloped at its superior part. The posterior extremity of its body presented many globules, in the form of a moveable group or cluster. These globules are of a bluish-green, which becomes of a tarnished yellow, in proportion as the animal approaches its end. Godeheu perceived in these grains the phosphoric matter with which it is provided. We can scarcely doubt that these minute corpuscles are the eggs, and thence their luminous property is the less surprising, since the eggs of many fishes and of several insects present us with a similar phenomenon. Its superior part is furnished with four moveable antennæ or horns, formed of many articulations, and terminated by tufts of very fine hair. The head is placed in the centre, and armed with some small hooks. Beneath it are two feet, bent, and furnished with hooks, and lower down there occur other organs of movement.

PHOLIS, in ichthyology, the name of a small anguilliform fish. The back is brown, the belly white, the whole back and sides are spotted, and the skin is soft, free of scales, but with a tough mucilaginous matter like the eel. This species most of all approaches to the alauda; and, though usually larger, yet Ray doubts whether it really differs from it in any thing essential; the distinction is in color, which though a very obvious, is certainly a very precarious one.

PHOLOE, 1. A mountain of Arcadia, near Pisa, so named from Pholus, who was buried in it; 2. Another in Thessaly, near mount Othrys. Plin. iv. 6; Lucan 3.

PHOLUS, in fabulous history, one of the Centaurs, who entertained Hercules, when going against the Erymanthian boar.—Paus. 3, Virg. Æn. 8, 294.

PHONAGOGUS, in music, the principal part or subject of a fugue.

PHONASCUS, among the ancient Greeks, but more particularly the Romans, was a person whose office was, by a certain signal, to admonish the singer or speaker when he was in danger of losing the natural tone of the voice, by overstraining it through the rapidity of his utterance. The emperor Nero ordered a phonascus, without whose presence he neither spoke nor sung, first, to check him when he sung or spoke too loud; and, if his admonition was neglected, to stop his mouth.

PHONICA, from φωνη, the voice. The name of the first order of the class pneumatica, in Good's Nosology. Diseases affecting the vocal avenues. It has six genera, viz. coryza, polypus, rhonchus, aphonia, dysphonia, psellismus.

PHO'NICS, *n. s.* } Gr. φωνη, sound: PHONOCAMP'TIC, *adj.* } The doctrine of sounds; having the power to inflect or turn a sound.

The magnifying the sound by the polyphonisms or repercussions of the rocks, and other *phonocamptick* objects. *Derham.*

PHONICS, is otherwise called ACOUSTICS. See that article.

PHORCUS, or PHORCYS, in mythology, the son of Neptune by Thoossa, who married his sister Ceto, by whom he had the Gorgons, the dragon that kept the gardens of the Hesperides, and other monsters.—Hesiod.

PHORMIO, an Athenian general, who reduced himself to poverty to maintain the dignity of his army. The Athenians paid his debts, and offered to make him head general, which he declined.

PHORMIUM, in botany, a genus of the monogynia order and hexandria class of plants. The most remarkable species is,

P. tenax (of Forster), the flax plant, a plant that serves the inhabitants of New Zealand instead of hemp and flax. Of this plant there are two sorts; the leaves of both resemble those of flags, but the flowers are smaller, and their clusters more numerous; in one kind they are yellow, and in the other a deep red. Of these leaves, with very little preparation, they make common apparel, and their strings, lines, and cordage, for every purpose; said to be much stronger than any thing we make with hemp. From the same plant, by another preparation, they draw long slender fibres, which shine like silk, and are as white as snow: of these, which are very strong, they make their finest cloths; and of the leaves, without any other preparation than splitting them into proper breadths, and tying the strips together, they make their fishing nets, some of which are of an enormous size.

PHORONEUS, in fabulous history, the son of Inachus by Melissa, brother of Io, and the second king of Argos. He married the nymph Laodice, by whom he had Apis and Niobe; civilised his subjects; built a temple to Juno, &c., and after death was worshipped as the god of the river of the same name.

PHORONIS, a patronymic of Io, or Isis.

PHORONIUM, a town of Argolis.

PHOSGENE GAS, so called by its discoverer Dr. John Davy, from its mode of production. Chloro-carbonaceous acid, a combination of carbonic oxide and chlorine, made by exposing a mixture of equal volumes of chlorine and carbonic oxide to the action of light. It has a peculiar pungent odor, is soluble in water, and is resolved into carbonic and muriatic acid gases. See CHEMISTRY, Index.

PHOS'PHOR, *n. s.* } Lat. *phosphorus*. The PHOS'PHORUS, } morning star; an inflammable substance. PHOSPHOR'IC, *adj.* }

Of lambent flame you have whole sheets in a handful of *phosphor*. *Addison.*

Liquid and solid *phosphorus* show their flames more conspicuously, when exposed to the air. *Cheyne.*

Why sit we sad when *phosphorus* shines so clear? *Pope.*

Phosphorus is obtained by distillation from urine putrified, by the force of a very vehement and long-continued fire. *Pemberton.*

When air's pure essence joins the vital flood,
And with *phosphoric* acid dyes the blood,
Your virgin trains the transient heat dispart,
And lead the soft combustion round the heart.
Darwin.

PHOSPHAS, PHOSPHAT, or PHOSPHATE, in chemistry, is a name that has been given to the combination of phosphoric acid with different bases. See PHOSPHATIC, and PHOSPHORIC ACID, and CHEMISTRY, Index.

PHOSPHATE OF YTTRIA is a mineral found in the neighbourhood of Lindenas, Norway, by M. Tank. Its color is yellowish-brown. Specific gravity 4·5577. It is scratched by steel. Fracture foliated in several directions. Externally dull; foliated fracture resinous lustre; transverse, greasy. In minute fragments, semitransparent and yellowish. At the blow-pipe it resembles phosphate of lime. With borax it affords a colorless bead, which becomes milky by cooling. The acids, even when concentrated, do not dissolve it. Its constituents are, by the analysis of Berzelius,

Yttria	62·58
Phosphoric acid, with a little fluoric	33·49
Subphosphate of iron . . .	3·93
	100·00

PHOSPHATIC ACID, in chemistry, is obtained by the slow combustion of cylinders of phosphorus in the air. For which purpose it is necessary that the air be renewed to support the combustion; that it be humid, otherwise the dry coat of phosphatic acid would screen the phosphorus from farther action of the oxygen; and that the different cylinders of phosphorus be insulated, to prevent the heat from becoming too high, which would melt or inflame them, so as to produce phosphoric acid. The acid, as it is formed, must be collected in a vessel, so as to lose as little of it as possible. All these conditions may be thus fulfilled:—We take a parcel of glass tubes which are drawn out to a point at one end; we introduce into each a cylinder of phosphorus a little shorter than the tube; we dispose of these tubes along-side of one another, to the amount of thirty or forty in a glass funnel, the beak of which passes into a bottle placed on a plate covered with water. We then cover the bottle and its funnel with a large bell-glass, having a small hole in its top, and another in its side. A film of phosphorus first evaporates, then combines with the oxygen and the water of the air, giving birth to phosphatic acid, which collects in small drops at the end of the glass tubes, and falls through the funnel into the bottle. A little phosphatic acid is also found on the sides of the bell-glass, and in the water of the plate. The process is a very slow one. The phosphatic acid thus collected is very dilute. We reduce it to a viscid consistence, says Dr. Ure, by heating it gently; and better still by putting it, at the ordinary temperature, into a capsule over another capsule full of concentrated sulphuric acid, under the receiver of an air-pump, from which we exhaust the air.

The acid thus formed is a viscid liquid, without color, having a faint smell of phosphorus, a strong taste, reddening strongly the tincture of litmus, and denser than water in a proportion not well determined. Every thing leads to the belief that this acid would be solid, could we deprive it of water. When it is heated in a retort, phosphureted hydrogen gas is evolved, and phosphoric acid remains. The oxygen and hydrogen of the water concur to this transformation. Phosphatic acid has no action, either on oxygen gas, or on the atmospheric air at ordinary temperatures. In combining with water, a slight degree of heat is occasioned.

From the experiments of M. Thenard, this acid seems to consist (exclusive of water) of 100 phosphorus united to about 110 oxygen, which is nearly the proportion of three primes phosphorus $= (3 \times 1{\cdot}5)\ 4{\cdot}5 + 5$ oxygen $= 5$.

But 2 prim. phosphorus + 4 ox. = 4 phosphoric acid.
And 1 + 1 = 1 phosphorous acid.

Hence the phosphatic acid would seem to result from the union of 2 primes of phosphoric acid with 1 of phosphoric acid. Now, M. Dulong has shown that the phosphatic acid in its action on the salifiable bases is transformed into phosphorous and phosphoric acids, whence proceed phosphites and phosphates.

Phosphorescence. See Light. In that article we have referred to Dr. Brewster's very complete account of marine phosphorescence in the Edinburgh Philosophical Journal. We may here add:—While examining the distribution of the aggregated groups of the carbonate of lime which forms a great portion of these plants, and which are essential and integral parts of their constitution, Dr. Brewster found that the plants were phosphorescent, when laid upon heated iron so as to display their entire outlines in the dark. He ascertained that each group or mass of the calcareous matter consisted of minute aggregated particles, which possessed double refraction, and had regular neutral and depolarising axes. They are held to the stem of the plant by a very fine transparent membrane. It is surprising that some of our most eminent botanists should have been so much misled as to suppose the calcareous matter to be an accidental deposit from the water in which they vegetate.

Phosphorescence of the sulphates of quinina and cinchonina.— M. Callaude has found that this substance becomes luminous when exposed to a gentle heat. M. Pelletier has likewise discovered that sulphate of cinchonina, both alone and when mixed with the sulphate of quinina, becomes luminous when exposed to the steam of boiling water; but that neither quinina nor cinchonina by themselves, nor their acetates, possess the property of being phosphorescent by heat. Journ. de Pharmacie, Sept. 1821.

Phosphorescence of potatoes.—Lichtenberg tells us that an officer on guard at Strasburgh, in passing the barracks, was alarmed not long since on observing a light in one of the barrack-rooms. As this was strictly prohibited, fire was suspected, and he hurried forward to the apartment. On entering it he found the soldiers sitting up in bed admiring a beautiful light, which proceeded from potatoes in an incipient state of putrefaction. The light was so vivid that the soldiers could see to read by it; it gradually became less and less vivid, and entirely disappeared by the night of the 10th of the month.

On the phosphorescence of marine animals.— During a voyage to the Shetland and Orkney Islands, in 1821, Dr. M'Culloch had various opportunities of investigating the phenomena of marine luminous animals. In proceeding from the Mull of Cantyre to Shetland, and in almost all the harbours of Shetland and Orkney, he found the water filled with a species of animal which he considers to have been undescribed. A cubic inch of water did not contain fewer than 100 of these animals. In the same view, and nearly at all times, the water was found filled with several different species, resembling in size some of the infusoria. Other animals of larger dimensions, and of many species, were equally constant, and, if less numerous, yet ten or twenty were always to be found within the space of a common tumbler glass. In all these cases the water was luminous. The light of the whole of these species disappeared when they died, either from keeping the water too long, from warming it, or from the addition of spirits. Dr. M'Culloch has added upwards of 190 species to the list of luminous marine animals. The most conspicuous among these are about twenty small species of medusa, in addition to those already known to be luminous. In the ancient genus cancer a considerable number of squillæ were also found possessed of phosphorescence. In the genera scolopendra and nereis five or six were luminous, which were all the species observed by Dr. M'Culloch. The other known genera in which luminous species were observed were phalangium, monoculus, oniscus, iulus, vorticella, cercaria, vibrio, volvox. To these Dr. M'Culloch adds, among the fishes, a new species of leptocephalus. The remaining luminous animals consisted of new genera, or at least of animals which could not be referred to any as yet to be found in authors. Dr. M'Culloch seems to think that the ling and other fish which inhabit the submarine valleys, at depths to which the light of day cannot penetrate, must perceive their food, and pursue their avocations, by the phosphorescence of their prey, or of the animals which abound in the sea, or by phosphorescence elicited from their own bodies. Dr. M'Culloch's observations were generally made in harbours, but never at a distance exceeding eight or ten miles from land. See the Journal of Science, Literature, &c., vol. xi. p. 248.

On the phosphorescence of the lampiris noctiluca and splendidula. In a curious paper on the phosphorescence of the lampyris noctiluca and splendidula, published in the Bibliotheque Universelle for May 1821, p. 52, M. Macaire has drawn the following conclusions from numerous observations: 1. A certain degree of heat is necessary to the voluntary phosphorescence of these animals. 2. Their phosphorescence is excited by a degree of heat superior to the first, and is irrecoverably destroyed by a higher temperature. 3. All bodies capable of coagulating albumen take away from phosphorising matter its power of phosphorescence. 4. The phosphorescence cannot take place but in a gas which contains oxygen. 5. It is excited by the galvanic pile, but no effect is produced upon it by electricity. 6. The phosphorescent matter is composed principally of albumen. But see our article LIGHT.

PHOSPHORIC ACID. Bones of beef, mutton, or veal, being calcined to whiteness in an open fire, lose almost half of their weight. These must be pounded, and sifted; or the trouble may be spared by buying the powder that is sold to make cupels for the assayers, and is, in fact, the powder of burned bones ready sifted. To three pounds of the powder there may be added about two pounds of concentrated sulphuric acid. Four or five pounds of water must be also added to assist the action of the acid. The whole may be then left on a gentle sand heat for two or three days, taking care to supply the loss of water which happens by evaporation. A large quantity of water must then be added, the whole strained through a sieve, and the residual matter, which is sulphate of lime, must be edulcorated by repeated affusions of hot water, till it passes tasteless. The waters contain phosphoric acid with a little lime; and by evaporation, first in glazed earthen, and then in glass vessels, or rather in vessels of platina or silver (for the hot acid acts upon glass) afford the impure acid in a concentrated state, which, by the force of a strong heat in a crucible, may be made to acquire the form of a transparent consistent glass, though, indeed, it is usually of a milky opaque appearance. For making phosphorus, it is not necessary to evaporate the water further than to bring it to the consistence of a syrup; and the small portion of lime it contains is not an impediment worth the trouble of removing, as it affects the produce very little. But, when the acid is required in a purer state, it is proper to add a quantity of carbonate of ammonia, which, by double elective attraction, precipitates the lime that was held in solution by the phosphoric acid. The fluid, being then evaporated, affords a crystallised ammoniacal salt, which may be melted in a silver vessel, as the acid acts upon glass or earthen vessels. The ammonia is driven off by the heat, and the acid acquires the form of a compact glass as transparent as rock-crystal, acid to the taste, soluble in water, and deliquescent in the air. This acid is commonly pure, but nevertheless may contain a small quantity of soda, originally existing in the bones, and not capable of being taken away by this process, ingenious as it is. The only unequivocal method of obtaining a pure acid appears to consist in first converting it into phosphorus by distillation of the materials with charcoal, and then converting this again into acid by rapid combustion, at a high temperature, either in oxygen or atmospheric air, or some other equivalent process.

Phosphorus may also be converted into the acid state by treating it with nitric acid. In this operation, a tubulated retort, with a ground stopper, must be half filled with nitric acid, and a gentle heat applied. A small piece of phosphorus, being then introduced through the tube, will be dissolved with effervescence, produced by the escape of a large quantity of nitric oxide. The addition of phosphorus must be continued until the last piece remains undissolved. The fire being then raised, to drive over the remainder of the nitric acid, the phosphoric acid will be found in the retort, partly in the concrete and partly in the liquid form. When phosphorus is burned by a strong heat, sufficient to cause it to flame rapidly, it is almost perfectly converted into dry acid, some of which is thrown up by the force of the combustion, and the rest remains upon the supporter.

This substance has also been acidified by the direct application of oxygen gas passed through hot water, in which the phosphorus was liquefied or fused.

The general characters of phosphoric acid are:—1. It is soluble in water in all proportions, producing a specific gravity which increases as the quantity of acid is greater, but does not exceed 2·687, which is that of the glacial acid. 2. It produces heat when mixed with water, though not very considerable. 3. It has no smell when pure, and its taste is sour but not corrosive. 4. When perfectly dry, it sublimes in close vessels: but loses this property by the addition of water; in which circumstance it greatly differs from the boracic acid, which is fixed when dry, but rises by the help of water. 5. When considerably diluted with water, and evaporated, the aqueous vapor carries up a small portion of the acid. 6. With charcoal or inflammable matter, in a strong heat, it loses its oxygen, and becomes converted into phosphorus.

Phosphoric acid is difficult of crystallising.

Though the phosphoric acid is scarcely corrosive, yet, when concentrated, it acts upon oils, which it discolors and at length blackens, producing heat, and a strong smell like that of ether and oil of turpentine; but does not form a true acid soap. It has most effect on essential oils, less on drying oils, and least of all on fat oils. From the syntheses of the phosphates of soda, barytes, and lead, Berzelius deduces the prime equivalent of phosphoric acid to be 4·5. But the experiments of Berzelius on the synthesis of the acid itself show it to be a compound of about 100 phosphorus + 133 oxygen. Lavoisier's synthesis gave 2 oxygen + 1·33 phosphorus. So did that of Sir H. Davy by rapid combustion in oxygen gas, as published in the Philosophical Transactions for 1812. M. Dulong in an elaborate paper published in the third volume of the Memoires D'Arceuil, gives, as the result of diversified experiments, nearly the proportions of 100 phosphorus to 123 oxygen; or of 5 oxygen + 4 phosphorus = 9 for the acid equivalent.

Sir H. Davy, with his well known sagacity, invented a new method of research, to elude the former sources of error. He burned the vapor of phosphorus as it issues from a small tube, contained in a retort filled with oxygen gas. By adopting this process, he determined the composition of phosphoric acid to be 100 phosphorus + 134·5 oxygen; whence its equivalent comes out 3·500. Phosphorous acid he then shows to consist of 1 oxygen + 1·500 phosphorus = 2·500.

M. Dumas in an elaborate memoir on Phosphureted Hydrogen (Ann. de Chim. et de Phys. xxxi.) endeavours to show that phosphoric acid consists of 1 atom of phosphorus, 4·0 + 5 atoms of oxygen, 5 = 9; while phosphorous acid consists of 1 atom of phosphorus 4 + 3 atoms of oxygen, 3 = 7. See PHOSPHURETED HYDROGEN.

By the above atomic weights 1·5 phosphorus combines with 1·125 oxygen (instead of 1) to constitute phosphorous acid; and with 1·875 oxygen to constitute phosphoric acid. If phosphoric acid be made 9, then in the phosphates of soda, barytes, and lead, we must admit 2 atoms of base; thus giving them the characters of subsalts, which that of soda manifestly possesses.

PHOSPHORITE, in mineralogy, a subspecies of apatite. Common phosphorite is of a yellowish-white color, when rubbed in an iron mortar, or thrown on red hot coals. It emits a green-colored phosphoric light. It is found in Estremadura in Spain. Earthy phosphorite is of a grayish-white color, and consists of dull dusty particles, which phosphoresce on glowing coals. It is found in Hungary.

PHOSPHORUS, Gr. φως, light, and φερω, to carry. An assumed simple substance which has never been found pure in nature. It is always met with united to oxygen, and in this state very plentiful. If phosphoric acid be mixed with one-fifth of its weight of powdered charcoal, and the mixture distilled at a moderate red heat, in a coated earthen retort, whose beak is partially immersed in a basin of water, drops of a waxy-looking substance will pass over, and, falling into the water, will concrete into the solid of phosphorus.

M. Javal finds that the subphosphate of lime obtained by digesting five parts of calcined bone powder with two parts of sulphuric acid, is better adapted to yield phosphorus by ignition with charcoal in a retort than pure phosphoric acid. The latter sublimes in a great measure undecomposed. Ann. de Chim. et de Phys. June, 1820.

It must be purified by straining it through a piece of chamois leather, under warm water. It is yellow and semi-transparent. It is as soft as wax, but fully more cohesive and ductile. Its specific gravity is 1·77. It melts at 90° Fahrenheit, and boils at 550°. In the atmosphere, at common temperatures, it emits a white smoke, which, in the dark, appears luminous. This smoke is acidulous, and results from the slow oxygenation of the phosphorus. In air perfectly dry, however, phosphorus does not smoke, because the acid which is formed is solid, and closely incasing the combustible, screens it from the atmospherical oxygen.

When phosphorus is heated in the air to about 148° it takes fire, and burns with a splendid white light, and a copious dense smoke. If the combustion take place within a large glass receiver, the smoke becomes condensed into snowy looking particles, which fall in a massive shower, coating the bottom plate with a spongy white efflorescence of phosphoric acid. This acid snow soon liquefies by the absorption of aqueous vapor from the air. When it is inflamed in oxygen the light and heat are incomparably more intense; the former dazzling the eye, and the latter cracking the glass receiver. Solid phosphoric acid results; consisting of 4 phosphorus + 5·0 oxygen, or 1 atom of phosphorus + 5 of oxygen.

Phosphorus, heated in highly rarefied air, forms three products: one is phosphoric acid; the second a volatile white powder; and the third is a red solid of comparative fixity, requiring a heat above that of boiling water for its fusion. The volatile substance is soluble in water, imparting acid properties to it. It seems to be phosphorous acid. The red substance is probably an oxide of phosphorus, since for its conversion into phosphoric acid it requires less oxygen than phosphorus does. See PHOSPHORIC, PHOSPHOROUS, and HYDROPHOSPHOROUS ACIDS.

Phosphorous acid is composed of 1 atom phosphorus + 3 oxygen = 4 + 3 = 7.

Phosphorus and chlorine combine with great facility, when brought in contact with each other at common temperatures. When chlorine is introduced into a retort exhausted of air, and containing phosphorus, the phosphorus takes fire, and burns with a pale flame, throwing off sparks; while a white substance rises and condenses on the sides of the vessel. If the chlorine be in considerable quantity, as much as twelve cubic inches to a grain of phosphorus, the latter will entirely disappear, and nothing but the white powder will be formed, into which about nine cubic inches of the chlorine will be condensed. No new gaseous matter is produced. The powder is a compound of phosphorus and chlorine, first described as a peculiar body by Sir H. Davy in 1810; and various analytical and synthetical experiments which he made with it prove that it consists of about 1 phosphorus, and 6·8 chlorine in weight. The equivalent ratio of 1 prime of the first + 6 of the second constituent, gives 4 to 27, or 1 to 6·75. It is the bichloride of phosphorus. This case shows the necessity in chemistry of abiding by experiment; for Sir H. Davy's untrimmed result, which had been called in question or lightly esteemed by the ultra-atomists, who pitched on 1·5 for the prime equivalent of phosphorus, is now seen to accord perfectly with the corrected prime equivalent of Dumas.

Its properties are very peculiar. It is snow-white, extremely volatile, rising in a gaseous form at a temperature much below that of boiling water. Under pneumatic pressure it may be fused, and then it crystallises in transparent prisms. It acts violently on water, decomposing it, whence result phosphoric and muriatic acids; the former from the combination of the phosphorus with the oxygen, and the latter from that of the chlorine with the hydrogen of the water. It produces flame when exposed to a lighted taper. If it be transmitted through an ignited glass tube along with oxygen, it is decomposed, and phosphoric acid and chlorine are obtained. The superior fixity of the acid above the chloride seems to give that ascendancy of attraction to the oxygen here, which the chlorine possesses in most other cases. Dry litmus paper exposed to its vapor in a vessel exhausted of air is reddened. When introduced into a vessel containing ammonia, a combination takes place, accompanied with much heat, and there results a compound, insoluble in water, undecomposable by acid or alkaline solutions, and possessing characters analogous to earths.

The protochloride of phosphorus was first obtained in a pure state by Sir H. Davy, in the year 1809. If phosphorus be sublimed through corrosive sublimate, in powder in a glass tube, a limpid fluid comes over as clear as water, and having a specific gravity of 1·45. It emits acid fumes when exposed to the air, by decomposing the aqueous vapor. If paper imbued with it be exposed to the air, it becomes acid without inflammation. It does not redden dry litmus paper plunged into it. Its vapor burns in the flame of a candle. When mixed with water, and heated, muriatic acid flies off, and phosphorous acid remains. See Phosphorous Acid. If it be introduced into a vessel containing chlorine, it is converted into the bichloride; and, if made to act upon ammonia, phosphorus is produced, and the same earthy-like compound results as that formed by the bichloride and ammonia.

When phosphorus is gently heated in the protochloride, a part of it dissolves, and the fluid, on exposure to air, gives off acid fumes, from its action on atmospheric moisture, while a thin film of phosphorus is left behind, which usually inflames by the heat generated from the decomposition of the vapor. The first compound of this kind was obtained by M. M. Gay Lussac and Thenard, by distilling phosphorus and calomel together, in 1808; and they imagined it to be a peculiar combination of phosphorus, oxygen, and muriatic acid. No experiments have yet ascertained the quantity of phosphorus which the protochloride will dissolve. Probably, says Sir H. Davy, a definite combination may be obtained, in which the proportion of chlorine will correspond to the proportion of oxygen in the oxide of phosphorus.

The compounds of iodine and phosphorus have been examined by Sir H. Davy and M. Gay Lussac. Phosphorus unites to iodine with the disengagement of heat, but no light. One part of phosphorus and eight of iodine form a compound of a red orange-brown color, fusible at about 212°, and volatile at a higher temperature. When brought in contact with water, phosphureted hydrogen gas is disengaged, flocks of phosphorus are precipitated, and the water, which is colorless, contains in solution phosphorous and hydriodic acids. One part of phosphorus and sixteen of iodine produce a crystalline matter of a grayish-black color, fusible at 84°. The hydriodic acid produced by bringing it in contact with water is colorless, and no phosphureted hydrogen gas is disengaged. One part of phosphorus and twenty-four of iodine produce a black substance partially fusible at 115°. Water dissolves it, producing a strong heat, and the solution has a very deep brown color, which is not removed by keeping it for some time in a gentle heat. With 1 phosphorus and 4 iodine, two compounds, very different from each other, are obtained. One of them has the same color as that formed of 1 phosphorus + 8 iodine, and seems to be the same with it. It melts at 217·5°, and, when dissolved in water, yields colorless hydriodic acid, phosphureted hydrogen, and phosphorus; which last precipitates in orange-yellow flocks. The other compound is a reddish-brown, does not melt at 212°, nor at a considerably higher temperature. Water has no sensible action on it. Potassa dissolves it with the disengagement of phosphureted hydrogen gas; and, when aqueous chlorine is poured into the solution, it shows only traces of iodine. When heated in the open air, it takes fire and burns like phosphorus, emitting white vapors, without any iodine. When these vapors were condensed in a glass jar by M. Gay Lussac he could perceive no iodine among them. This red substance is always obtained when the phosphorus is in the proportion of 1 to 4 of iodine. M. Gay Lussac is inclined to consider it as identical with the red matter which phosphorus so often furnishes, and which is at present considered as an oxide. In whatever proportions the iodide of phosphorus has been made, it exhales acid vapors, as soon as it is moistened, owing to the hydriodic acid formed by the decomposition of the water. Such is the account of the iodide of phosphorus given by M. Gay Lussac. The combining ratios are somewhat uncertain.

Phosphorous Acid was discovered in 1812 by Sir H. Davy. When phosphorus and corrosive sublimate act on each other, at an elevated temperature, a liquid called protochloride of phosphorus is formed. Water, added to this, resolves it into muriatic and phosphorous acids. A moderate heat suffices to expel the former, and the latter remains, associated with water. It has a very sour taste, reddens vegetable blues, and neutralises bases. When heated strongly, in open vessels, it inflames. Phosphureted hydrogen flies off, and phosphoric acid remains. Ten parts of it heated in close vessels give off one-half of a phosphureted hydrogen, and leave 8½ of phosphoric acid. Hence the liquid acid consists of 80·7 acid + 19·3 water. Its prime equivalent is either 2·5 or 7. See PHOSPHURETED HYDROGEN.

A hypophosphorous acid was lately discovered by Dulong. Pour water on the phosphuret of barytes, and wait till all the phosphureted hydrogen be disengaged. Add cautiously to the filtered liquid dilute sulphuric acid, till the barytes be all precipitated in the state of sulphate. The supernatant liquid is hypophosphorous acid, which should be passed through a filter. This liquid may be concentrated by evaporation, till it become viscid. It has a very sour taste, reddens vegetable blues, and does not crystallise. It is probably composed of 2 primes of phosphorus = 3 + 1 of oxygen. Dulong's analysis approaches to this proportion. He assigns, but from rather precarious data, 100 phosphorus to 37·44 oxygen. The hypophosphites have the remarkable property of being all soluble in water; while many of the phosphates and phosphites are insoluble.

Thenard succeeded in oxygenising phosphoric acid by the method described under NITRIC and MURIATIC ACIDS.

With regard to the phosphates and phosphites, we have many discrepancies in our latest publications. Sir H. Davy says, in his last memoir on some of the combinations of phosphorus, that new researches are required to explain the anomalies presented by the phosphates.

Phosphoric acid, united with barytes, produces an insoluble salt, in the form of a heavy white powder, fusible at a high temperature into a gray enamel. The best mode of preparing it is by adding an alkaline phosphate to the nitrate or muriate of barytes.

By mixing phosphate of ammonia with nitrate of barytes, Berzelius found that 68·2 parts of barytes, and 31·8 of phosphorus, composed 100 of the phosphate. Hence it is a subphosphate, and consists of,

Phosphoric acid	1 atom	= 9·0	68·42
Barytes	2	= 19·5	31·58
			100·0

He made a phosphate by dissolving the above in dilute phosphoric acid, and evaporating, when crystals were obtained composed, in 100 parts, of acid, 42·54; barytes 46·46; water 11. But by theory we have,

Acid	2 atoms	18	42·857	100·000
Base	2	19·5	46·430	
Water	4	4·5	10·713	

By pouring a solution of the preceding salt into alcohol, a sesquiphosphate is obtained, in the form of a light white powder, containing 1½ times as much acid as the subphosphate.

The phosphate of strontian differs from the preceding in being soluble in an excess of its acid.

Phosphate of lime is very abundant in the native state. See APATITE. It likewise constitutes the chief part of the bones of all animals.

Phosphate of lime is very difficult to fuse, but in a glass-house furnace it softens, and acquires the semitransparency and grain of porcelain. It is insoluble in water; but, when well calcined, forms a kind of paste with it, as in making cupels. Besides this use of it, it is employed for polishing gems and metals, for absorbing grease from cloth, linen, or paper, and for preparing phosphorus. In medicine it has been strongly recommended against the rickets by Dr. Bonhomme of Avignon, either alone or combined with phosphate of soda. The burnt hartshorn of the shops is a phosphate of lime.

An acidulous phosphate of lime is found in human urine, and may be crystallised in small silky filaments, or shining scales, which unite together into something like the consistence of honey, and have a perceptibly acid taste. It may be prepared by partially decomposing the calcareous phosphate of bones by the sulphuric, nitric, or muriatic acid, or by dissolving that phosphate in phosphoric acid. It is soluble in water, and crystallisable. Exposed to the action of heat, it softens, liquefies, swells up, becomes dry, and may be fused into a transparent glass, which is insipid, insoluble, and unalterable in the air. In these characters it differs from the glacial acid of phosphorus. It is partly decomposable by charcoal, so as to afford phosphorus.

By pouring phosphate of soda into muriate of lime, Berzelius obtained a phosphate of lime consisting of acid 100, lime 84·53. The exact proportions are,

Phosphuric acid = 9 = 100
Lime 3·5 × 2 = 7 = 78 nearly.

The phosphate of potassa is very deliquescent, and not crystallisable, but condensing into a kind of jelly. Like the preceding species, it first undergoes the aqueous fusion, swells, dries, and may be fused into a glass; but this glass deliquesces. It has a sweetish saline taste. The phosphate of soda is now commonly prepared by adding to the acidulous phosphate of lime as much carbonate of soda in solution as will fully saturate the acid. The carbonate of lime which precipitates, being separated by filtration, the liquid is duly evaporated so as to crystallise the phosphate of soda; but, if there be not a slight excess of alkali, the crystals will not be large and regular. The crystals are rhomboidal prisms of different shapes; efflorescent; soluble in three parts of cold and one and a half of hot water. They are capable of being fused into an opaque white glass, which may be again dissolved and crystallised. It may be converted in an acidulous phosphate by an addition of acid, or by either of the strong acids, which partially, but not wholly, decompose it. As its taste is simply saline, without any thing disagreeable, it is much used as a purgative, chiefly in broth, in which it is not distinguishable from common salt. For this elegant addition to our pharmaceutical preparations we are indebted to Dr. Pearson. In assays with the blow-pipe it is of great utility; and it has been used instead of borax for soldering.

In crystals, this salt is composed, according to Berzelius, of phosphoric acid 20·33, soda 17·67, water 62·00: and, in the dry state, of acid 53·48, soda 46·52. If it be represented by 1 atom of acid = 9 + 2 atoms soda = 8, then 100 of the dry salt will consist of acid 53, base 47; and, in the crystallised state, of

Water	24 atoms	27	61·4
Acid	1	9	20·4
Soda	2	8	18·2
			100·0

which presents a good accordance with the experimental results of the accurate Berzelius.

The phosphate of ammonia crystallises in prisms with four regular sides, terminating in pyramids, and sometimes in bundles of small needles. Its taste is cool, saline, pungent, and urinous. On the fire it comports itself like the preceding species, except that the whole of its base may be driven off by a continuance of the heat, leaving only the acid behind. It is but little more soluble in hot water than in cold, which takes up a fourth of its weight. It is pretty abundant in human urine. It is an excellent flux both for assays and the blow-pipe, and in the fabrication of colored glass and artificial gems.

Phosphate of magnesia crystallises in irregular hexahedral prisms, obliquely truncated; but is commonly pulverulent, as it effloresces very quickly. It requires fifty parts of water to dissolve it. Its taste is cool and sweetish. This salt too is found in urine. Fourcroy and Vauquelin have discovered it likewise in small quantity in the bones of various animals, though not in those of man. The best way of preparing it is by mixing equal parts of the solutions of phosphate of soda and sulphate of magnesia, and leaving them some time at rest, when the phosphate of magnesia will crystallise, and leave the sulphate of soda dissolved.

An ammoniaco-magnesian phosphate has been discovered in an intestinal calculus of a horse by Fourcroy, and since by Bartholdi, and likewise by the former in some human urinary calculi. See Calculus. Notwithstanding the solubility of the phosphate of ammonia, this triple salt is far less soluble than the phosphate of magnesia. It is partially decomposable into phosphorus by charcoal, in consequence of its ammonia.

The phosphate of glucine has been examined by Vauquelin, who informs us that it is a white powder, or mucilaginous mass, without any perceptible taste; fusible, but not decomposable by heat; unalterable in the air, and insoluble unless in an excess of its acid.

It has been observed that the phosphoric acid, aided by heat, acts upon silex; and we may add, that it enters into many artificial gems in the state of a siliceous phosphate. See Salt.

Phosphorus (of Baldwin), a name for ignited muriate of lime.

Phosphorus (of Canton). Oyster shells calcined with sulphur.

Phosphorus (of Bologna). See Light. Sulphate of barytes.

PHOSPHURET. A compound of phospqorus with a combustible or metallic oxide.

Phosphureted Hydrogen. Of this compound there are two varieties; one of which may be called perphosphureted hydrogen; another protophosphureted hydrogen.

1. *Perphosphureted hydrogen.* Into a small retort filled with milk of lime, or potassa water, let some fragments of phosphorus be introduced, and let the heat of an Argand flame be applied to the bottom of the retort, while its beak is immersed in the water of a pneumatic trough. Bubbles of gas will come over, which explode spontaneously with contact of air. It may also be procured by the action of dilute muriatic acid on phosphuret of lime. In order to obtain the gas pure, however, we must receive it over mercury. Its smell is very disagreeable. Its specific gravity is 0·9022. 100 cubic inches weigh 27·5 grains. In oxygen it inflames with a brilliant white light. In common air, when the gaseous bubble bursts the film of water and explodes, there rises up a ring of white smoke, luminous in the dark. Water absorbs about one-fortieth of its bulk of this gas, and acquires a yellow color, a bitter taste, and the characteristic smell of the gas. When brought in contact with chlorine it detonates with a brilliant green light; but the products have never been particularly examined. By transmitting a series of electric explosions through phosphureted hydrogen, the phosphorus is precipitated, and hydrogen of the original gaseous volume remains. Hence the composition of the gas may be deduced from a comparison of its specific gravity with that of hydrogen.

Phosphureted hydrogen	0·9022
Hydrogen	0·0694
Phos. = difference of weight,	0·8328

Thus we perceive that this compound consists of 0·8328 phosphorus + 0·0694 hydrogen; or 12 + 1; or 1·5 + 0·125 = 1·625, which is the weight of the sum of the primes, commonly called the weight of its atom. The gas may be likewise conveniently analysed by nitrous gas, nitrous oxide, or oxygen. The preceding densities and proportions are those currently given by British writers, and are probably incorrect. See these numbers corrected by M. Dumas further on, and also in the general Table of Gases.

2. *Protophosphureted hydrogen.* It was discovered by Sir H. Davy in 1812. When the crystalline hydrate of phosphorous acid is heated in a retort out of the contact of air, solid phosphoric acid is formed, and a large quantity of subphosphureted hydrogen is evolved. Its smell is fetid, but not so disagreeably so as that of the preceding gas. It does not spontaneously explode like it with oxygen; but at a temperature of 300° a violent detonation takes place. In chlorine it explodes with a white flame. Water absorbs one-eighth of its volume of this gas. When potassium is heated in it its volume is doubled, and the resulting gas is pure hydrogen. When sulphur is sublimed in one volume of it

a sulphuret of phosphorus is formed, and nearly two volumes of sulphureted hydrogen are produced.

Such is the constitution of these two compounds of phosphorus and hydrogen as taught by our systematists, and confirmed to apparent demonstration by Dr. Thomson in his First Principles of Chemistry, I. 203. But it is to be feared that the atomic theory, misapplied, has here acted as a false light merely to mislead from the straight path of experiment. For M. Dumas in an able memoir has adduced very decisive evidence of the inaccuracy of the above views, and has been led to conclude that protophosphureted and perphosphureted hydrogen contain each the same bulk of hydrogen, that is, $1\frac{1}{2}$ time their own volume; that the quantities of phosphorus with which that hydrogen is combined in the two gases are not in the ratio of 1 to 2, but of 2 to 3; that the ratio of 3 to 5 instead of 1 to 2, holds with regard to the oxygen in phosphorous and phosphoric acids, agreeably to the well known determination of Berzelius; and finally that the gases obtained by heating phosphorous acid, or by leaving perphosphureted hydrogen over water or mercury for a few days, are not different in their nature, but truly identical. We therefore present the results of M. Dumas in a supplementary form, whence they may be compared with those latterly adopted in this country.

1. *Protophosphureted hydrogen.* This gas may be obtained perfectly pure by heating the phosphatic, phosphorous, or hypophosphorous acids, or by admitting fragments of phosphuret of lime or barytes to concentrated muriatic acid. But the gas disengaged from phosphuret of lime by water alone, or by muriatic acid diluted with ten times its weight of water, consists in the former case of perphosphureted hydrogen 87 + hydrogen 13; and in the latter of perphosphureted hydrogen 97 + water 7. Protophosphureted hydrogen is not spontaneously combustible in air, as the other gas is. 100 measures of protophosphureted hydrogen, heated with bichloride of mercury, afford 300 measures of muriatic acid gas, which contain 150 of hydrogen. But, when 100 measures of that phosphureted gas are heated in contact with sulphur, only 135 measures of sulphureted hydrogen are obtained instead of 150; because 100 of sulphureted hydrogen become ninety by being heated with sulphur; and 90 : 100 :: 135 : 150. From inattention to this important fact, several analytical errors have arisen. The detonation of protophosphureted hydrogen mixed with oxygen is elegantly effected by a slight difference of pressure: by raising for instance the eudiometer tube a few inches above the level of the mercury. If this circumstance be not adverted to, unexpected explosions may occur.

One volume of protophosphureted hydrogen gas absorbs in explosion two volumes of oxygen; and, as the volume and a half of hydrogen which it contains requires three-fourths of a volume of oxygen, the remaining five-fourths of a volume of oxygen must go to the phosphorus. One volume of this phosphureted gas may also combine with a volume and a half of oxygen, in which case phosphorous acid is formed with the three-fourths of oxygen; whereas phosphoric acid was the former product with the five-fourths of oxygen. Thus it would appear that the quantities of oxygen in phosphorous and phosphoric acids are to each other in the proportion of 3 to 5. The perphosphureted hydrogen procured by the action of phosphorus on milk of lime is spontaneously transformed by keeping over water to the protophosphureted gas, without experiencing any alteration in its volume, simply by depositing phosphorus. The proportion of pure hydrogen which is always present in the perphosphureted gas, and which of course remains mixed with the protophosphureted, is easily ascertained by solution of sulphate of copper, which speedily absorbs the phosphureted gas. Protophosphureted gas thus prepared and examined was weighed with all the requisite precautions, and found to have a specific gravity of 1·214, air being 1000. Deducting from 1·214, 0·104 ($= 0·0694 + \frac{0·0694}{2}$), being a volume and a half of hydrogen, the remainder 1·110 is the weight of phosphorus combined in this gas with the 0·104 of hydrogen. Now this is nearly the ratio of 10 to 1; whence, if we were to consider it a compound of one atom of each constituent, the prime equivalent of phosphorus would come out 10·78 on the hydrogen scale, or 1·4 on the oxygen. M. Dumas, who adopts, with Berzelius, 0·0623 as the atom of hydrogen and the radix of atomic weights, supposes that in the protophosphureted gas six atoms of hydrogen are combined with one of phosphorus, and infers the equivalent of phosphorus to be 402·3: for,

0·103 : 1·111 :: 37·4 (= 6 H) : 402·3.

The number of Berzelius is 392·3; therefore M. Dumas proposes to assume 400, the same as M. Dulong fixed on from the analyses of perchloride of phosphorus and phosphuret of copper.

2. *Perphosphureted hydrogen.* This gas, obtained by acting on phosphorus in a retort, with a boiling-hot solution of caustic potassa, consists very uniformly of thirty-seven and a half of perphosphureted gas, mixed with sixty-two and a half of pure hydrogen; or of three of the former to five of the latter. The phosphureted gas is easily abstracted by a solution of sulphate or nitrate of copper, or of corrosive sublimate. Phosphuret of barytes disengages from distilled water a mixed gas, consisting of forty-three of pure hydrogen, and fifty-seven of the perphosphureted gas. Phosphuret of lime, acted on by a little water over mercury, affords a similar mixture of gases, of which eighty-seven are perphosphureted, and thirteen pure hydrogen. The same substance, acted on by strong muriatic acid, affords protophosphureted hydrogen with deposition of phosphorus. The perphosphureted hydrogen obtained by boiling milk of lime on phosphorus is most variable in its proportion of intermingled hydrogen; this being near the beginning of the process about thirty per cent., and towards the end so high as eighty-six. Yet all these gases are equally inflammable in the air.

Corrosive sublimate acts on the above mixed gases as it does on protophosphureted hydrogen, and the hydrogen gas intermingled remains pure, without combining with the chlorine, at least at the heat of the alcohol flame. The action of the corrosive sublimate becomes energetic whenever it melts. The gas enlarges much in volume, and an orange-brown matter is produced. Seventy-six parts of the mixed gas, containing forty-seven and a half of pure hydrogen and twenty-eight and a half of perphosphureted gas, afforded eighty-six of muriatic acid gas, containing forty-three of hydrogen; whence perphosphureted hydrogen evidently contains a volume and a half of pure hydrogen condensed into one volume, just like the protophosphureted gas. The gas from phosphuret of lime and water, which is the purest that can be obtained, afforded also, by a similar treatment, three volumes of muriatic acid gas for every volume of the pure perphosphureted hydrogen, indicating one volume and a half of pure hydrogen condensed in that single volume. The mixed gas from phosphuret of lime and water contains from eleven to twelve per cent. of uncombined hydrogen. Such mixed gas, heated by a spirit flame, in contact with fine iron or copper wire in a glass vessel, affords out of every volume of the perphosphureted gas one volume and a half of pure hydrogen.

In order to effect the analysis of the perphosphureted gas by oxygen, M. Dumas prepared absolutely pure carbonic acid. Some of it he mixed with its own volume of pure oxygen; and some with variable proportions of perphosphureted hydrogen obtained from potassa w ter and phosphorus. He then heated the mixture of carbonic acid gas and oxygen to 212° or 230° Fahrenheit, and introduced into it by bubble after bubble the mixture of carbonic acid and perphosphureted hydrogen. With these precautions the experiment proceeded quietly; each bubble exploded on entering, however minute it might be. The light was faint and yellowish, without the lustre and vivacity observed in the ordinary combustions of this kind. When the operation was completed, he absorbed the carbonic acid by moist fragments of caustic potassa used in excess, and measured carefully the residuum, ascertaining the purity of the residual oxygen by explosion with hydrogen in the eudiometer over mercury. From the mean of these experiments, it results that 151 measures of perphosphureted hydrogen, produced by the action of phosphorus on water of potassa, consume 152 measures of oxygen; which may be regarded as the ratio of volume to volume. But this ratio, so simple in appearance, becomes somewhat complex when we come to consign, to each of the bodies that the perphosphureted hydrogen contains, the portion of oxygen due to it. In fact,

8 measures of the above gas = 5 hydrogen + 3 perphosphureted hydrogen
8 oxygen = 2·5 + 5·5.

That is to say, three volumes of pure perphosphureted hydrogen consume 5·5 volumes of oxygen; or eight volumes consume 14·6 of oxygen; but

8 perphosphureted hydrogen pure = 12 hydrogen + x phosphorus
14·6 oxygen = 6 + 8·6 phosphorus.

It is therefore evident that, in the combustion of perphosphureted hydrogen made under the above specified conditions, the hydrogen takes two volumes of oxygen and the phosphorus three, to form water and phosphorous acid.

Perphosphureted hydrogen gas, left to itself for some days, loses a third of the phosphorus that it contains, passing to the state of protophosphureted hydrogen without any change of volume. When the perphosphureted hydrogen is decomposed by the protoxide of azote, eight volumes of the former consume twenty-one of the oxygen of the latter, six of which go to the twelve of hydrogen in the eight of the perphosphureted gas, and fifteen to the phosphorus. In this case phosphoric acid is formed. Hence the same quantity of phosphorus takes either nine or fifteen volumes of oxygen; which gives the relation of three to five, formerly noticed. The explosion of protoxide of azote and perphosphureted hydrogen is extremely violent, and ought on this account to be performed on small quantities.

The specific gravity of perphosphureted hydrogen, determined by M. Dumas with much care, was found to be . . . . . 1·761
from which if we deduct 1½ vol. of hydr. 0·104
we shall have the remainder . . = 1·657
for phosphorus. Here the proportion reduced to hydrogen as unity is sixteen to one. M. Dumas, supposing the hydrogen and the phosphorus to be combined in the ratio of four atoms of the former to two atoms of the latter, states the following proportion:—

0·103 : 1·658 :: 24·87 (= 4 H) : 400·33;

which would be the atomic weight of phosphorus on the scale of Berzelius, where oxygen = 100, and hydrogen = 6·2175, or nearly $\frac{12{\cdot}5}{2}$.

In this ingenious and elaborate research of M. Dumas, nothing is more striking than the difference between his specific gravities of these two gases and the densities assigned to the same gases in Dr. Thomson's First Principles, where every number, by a process of logical legerdemain, is made to tally with his atomic notions to the third or fourth place of decimals. Thus his gas (perphosphureted hydrogen) from phosphuret of lime and water has a specific gravity of 0.90277; and is thus made up:—

Hydrogen,	1 volume	0.06944 or	1 atom	0·125
Phosphorus,	1 do.	0·83333	1	1·5 !
		0·90277		

Bihydroguret of phosphorus (protophosphureted hydrogen of Dumas).

Hydrogen, 2 vols. . . .	0·1388
Phosph. 1 do.	0·8333
	0·9721

Here this gas is made to contain two volumes of hydrogen, and have a density = 0·9722.

Phosphorus and sulphur are capable of combining. They may be united by melting them together in a tube exhausted of air, or under water. In this last case they must be used in small quantities; as, at the moment of their action, water is decomposed, sometimes with explosions. They unite in many proportions. The most fusible compound is that of one and a half of sulphur to two of phosphorus. This remains liquid at 40° Fahrenheit. When solid, its color is yellowish-white. It is more combustible than phosphorus, and distils undecompounded at a strong heat. Had it consisted of 2 sulphur + 4 phosphorus, we should have had a definite compound of 1 prime of the first + 1 of the second constituent. This proportion forms the best composition for phosphoric fire-matches or bottles. A particle of it attached to a brimstone match inflames when gently rubbed against a surface of cork or wood. An oxide made by heating phosphorus in a narrow-mouthed phial with an ignited wire answers the same purpose. The phial must be kept closely corked, otherwise phosphorous acid is speedily formed.

Phosphorus is soluble in oils, and communicates to them the property of appearing luminous in the dark. Alcohol and ether also dissolve it, but more sparingly.

When swallowed in the quantity of a grain it acts as a poison. Azote dissolves a little of it, and has its volume enlarged by about one-fortieth.

PHOTINIANS, in ecclesiastical history, a sect of heretics in the fourth century, who denied the divinity of our Lord. They derive their name from

PHOTINUS, their founder, who was bishop of Sirmium, and a disciple of Marcellus. Photinus published, in the year 343, his notions respecting the Deity, which were repugnant both to the orthodox and Arian systems. He asserted that Jesus Christ was born of the Holy Ghost and the Virgin Mary; that a certain divine emanation, which he called the Word, descended upon him; and that because of the union of the divine word with his human nature he was called the Son of God, and even God himself: that the Holy Ghost was not a person, but merely a celestial virtue proceeding from the Deity. Both parties condemned the bishop in the councils of Antioch and Milan, held in the years 345 and 347. He was condemned also by the council at Sirmium in 351, and was afterwards degraded from the episcopal dignity, and at last died in exile in the year 372 or 375. His opinions were afterwards revived by Socinus.

PHOTIUS, patriarch of Constantinople, was one of the finest geniuses of his time. He was born in Constantinople, and descended of a noble family. His merit raised him to the patriarchate; for, Bardas having driven Ignatius from the see, Photius was consecrated by Asbestus in 859. He condemned Ignatius in a synod, whereupon the pope excommunicated him, and he, to balance the account, anathematised the pope. Basilius of Macedon, the emperor whom Photius had reproved for the murder of Michael, expelled him, and restored Ignatius; but afterwards re-established Photius upon Ignatius's death, in 878. At last being wrongfully accused of a conspiracy against Leo the philosopher, son and successor to Basilius, he was expelled by him in 886, and died soon after. He wrote a Bibliotheca, which contains an examen of 280 authors; also 253 epistles; the Nomacanon under fourteen titles; an abridgment of the acts of several councils, &c. His natural abilities were very great. There was no branch of art or science in which he was not versed. He was first raised to the chief dignities of the empire, being made principal secretary of state, captain of the guards, and a senator; and in all these stations acquitted himself well. His rise to the patriarchate was very quick; for, being a layman, he was made monk the first day, reader the next, and the following day sub-deacon, deacon, and priest. So that in six days he attained to the highest office in the church. But his unbounded ambition made him commit excesses which rendered him a scourge to those about him. Fabricius calls his Bibliotheca, non liber, sed insignis thesaurus, 'not a book, but an illustrious treasure,' in which are contained many curious things no where else to be found. It was brought to light by Andrew Schotus, and communicated by him to David Hoeschelius, who caused it to be printed in 1601. Schottus translated it into Latin, and printed his translation alone in 1606. The Greek text and translation were printed at Geneva in 1611. The last and best edition was printed at Rouen in 1653, folio.

PHOTOCITE, a mixture of the silicate and carbo-silicate of manganese.

PHOTOMETER, an apparatus for measuring the intensity of light, and the transparency of the medium through which it passes. Instruments for this purpose have been invented by count Rumford, M. de Saussure, Mr. Leslie, and others. Mr. Leslie's is the simplest instrument of the kind, but it only measures the momentary intensities of light; and a description of all of them would take up too much room. We therefore refer the inquisitive reader to Nicholson's Philosophical Journal, vol. iii. De Saussure's photometer is also called a diaphanometer. Mr. Leslie's photometer may be considered as a differential thermometer, having one of its balls of colorless glass, the other of black glass. The light produces no effect upon the transparent ball, but it heats the black ball according to its intensity; and this heat, by depressing the liquid in the tube, marks the intensity of the light.

PHOTOPSIA (from φως, light, and οψις, vision), lucid vision. An affection of the eye in which the patient perceives luminous rays, ignited lines, or coruscations.

PHOXUS, a general of the Phocæans, who burnt Lampsacus.

PHRAGANDÆ, an ancient people of Thrace. Livy, xxvi. c. 25.

PHRAORTES, the son of Dejoces, and the second king of the Medes, succeeded his father about A. A. C. 657, and reigned twenty-two years. He was killed in a fruitless attempt on Nineveh, and was succeeded by his son Cyaxares I.

PHRASE, *n. s.* & *v. a.* } Gr. φρασις. Idiom; peculiar expression; mode of speech: to phrase is to term, style, call: PHRASEOL'OGY, *n. s.* phraseology, diction; style.

Thou speak'st
In better *phrase* and matter than thou didst.
Shakspeare.

These suns,
For so they *phrase* them, by their heralds challenged
The noble spirits to arms. *Id. Henry VIII.*

To fear the Lord, and depart from evil, are *phrases* which the Scripture useth to express the sum of religion. *Tillotson.*

Now mince the sin,
And mollify damnation with a *phrase*:
Say you consented not to Sancho's death,
But barely not forbad it. *Dryden.*

The scholars of Ireland seem not to have the least conception of a stile, but run on in a flat *phraseology*, often mingled with barbarous terms. *Swift.*

Precision is the third requisite of perspicuity with respect to words and *phrases*. *Murray.*

PHRASE is sometimes used for a short sentence or small set or circuit of words constructed together. In this sense father Buffier divides phrases into complete and incomplete. Phrases are complete where there is a noun and a verb, each in its proper function; i. e. where the noun expresses a subject, and the verb the thing affirmed of it. Incomplete phrases are those where the noun and the verb together only do the office of a noun; consisting of several words without affirming any thing, and which might be expressed in a single word. Thus, 'that which is true,' is an incomplete phrase, which might be expressed in one word, truth; as, 'that which is true satisfies the mind,' i. e. 'truth satisfies the mind.'

PHRASE, in music, means a complete sense composed of one or more musical propositions, terminated by a cadence more or less complete. In a phrase there may be various significations or ideas, viz. the principal, which commences and terminates the phrase, the expletives, incidents, oblique or subordinate. *To phrase* is to round, as in discourse, the different phrases of a musical period. Music, without phrases, called also hemistics, is sound without sense, whether in its composition or performance.

PHRASE, or PHRASED, a musical composition performed upon the principle of hemistics, or whose melodic phrases are rounded off.

PHRASEOLOGY is also used for a collection of the phrases or elegant expressions in any language.

PHREAS (John), M. D., an English physician, born at London in the end of the fourteenth century. He was educated at Oxford, and became fellow of Baliol College. He translated from the Greek into Latin Diodorus Siculus, and other ancient works. He read lectures on medicine at Ferrara, Florence, and Padua, at which last university he was presented with his degree. He died in 1465.

PHREATIS, or PHREATIUM, in Grecian antiquity, was a court belonging to the civil government of Athens, situated upon the sea-shore in the Piræus. The name is derived from απο τε φρεατος, because it stood in a pit; or, as others suppose, from the hero Phreatus. This court heard such causes as concerned persons who had fled out of their own country for murder, or those who fled for involuntary homicide, and who had afterwards committed a deliberate and wilful murder. The first who was tried in this place was Teucer, on a groundless suspicion that he had been accessory to the death of Ajax. The accused was not allowed to come to land, or so much as to cast anchor, but pleaded his cause in his bark; and if found guilty was committed to the mercy of the winds and waves, or, as some say, suffered more condign punishment; if innocent he was only cleared of the second fact, and, according to custom, underwent a twelvemonth's banishment for the former. See Potter's Gr. Antiquities, vol. i.

PHRENETIC is used of those who, without being absolutely mad, are subject to such strong sallies of imagination as in some measure pervert their judgment and cause them to act in a way different from the more rational part of mankind.

PHRENITIS is the same with phrenzy; an inflammation of the brain, attended with an acute fever and delirium. See MEDICINE.

PHRENOLOGY.

PHRENOLOGY (of Gr. φρην the mind, and λογος, a discourse), denotes strictly the science of mind, and has recently been applied to a new theory of philosophy, which teaches—

1. That the brain is a congeries of so many distinct parts, each of which is the organ of some innate special faculty.

2. That the power of manifesting each faculty is always proportionate to the size and activity of that organ or part of the brain with which it is supposed to be in immediate connexion.

3. That it is possible to ascertain, during life, the relative sizes of these organs by the corresponding protuberances or enlargements on the external surface of the cranium.

In our article BRAIN it is suggested that the term phrenology, in application to the hypothesis, the legitimacy of which is now to be discussed, 'seems too presumptive and too restrictive—too presumptive in implying or taking for granted that this is the true science of mind; and too restrictive, because the phrenic or mental part of the argument does not comprehend its whole scope and bearing; the system of Gall and Spurzheim (the principal founders and promulgators of it), constituting, when taken in its full stretch of latitude, in some sort a new system of neurology in general.' But Dr. Spurzheim, who we believe was the first to propose the present denomination, might have been guided in his choice by an anxiety which he and his original master, Gall, have ever manifested to scout the idea of their doctrines being, as some have supposed them to be, merely a new system of physiognomy. 'Denude,' says Dr. S., 'the whole of the brain, and present it to me without any cranial covering, and I will pledge myself to as correct an opinion of its phrenological character, as had I to judge of the same brain, surrounded and encompassed by its membraneous and bony investments.' Craniology, therefore, is an improper appellation to give to our science; and cranioscopy is obviously as bad, since they both suppose a knowledge only of the exterior, while our investigations and our inferences have to do with what is within much more than what is merely on the surface, or manifest to every beholder. Our anatomy is new, our physiology is new, our metaphysics are new; or rather, in reference to the last, we should say, that metaphysics has hitherto been a science merely in name, since it has abandoned physicology, and taught to satisfy itself with mere abstractions.

Our present duty is that of historians and narrators. If in the course of the present article a bearing to one side of the argument be discovered, let the reader be told that some twelve or fourteen years since, when Dr. Spurzheim's book first made its appearance, the individual who principally supplies this article furnished a review of Dr. S.'s volume, which all would agree in pronouncing rather condemnatory than in support of the doctrine. See Eclectic Review, 1815. Whether he still preserve his originally hostile feeling to the cause, or whether he be completely indifferent respecting the subject, and pretended science, is for any reader to determine who may think it worth his while to bestow an hour's consideration on the topic. All that we think it right further to say in the way of preface is this, that impartiality shall at any rate be aimed at, and that failure shall not be legitimately chargeable upon design or intention. It may be proper to remind the reader too, that, although the plural pronoun is used in the construction of the paper, as is usual in all articles admitted into a miscellaneous collection, neither the editor, or other contributors, are responsible for the opinions of individual writers on subjects open to controversy.

We cannot perhaps give a more convincing proof of our impartial feeling than by freely extracting from able writers, who have taken different estimates of the validity of this doctrine. The first of them, an acute reasoner, is decidedly hostile to its claims.

'Neither in man nor in animals,' says Mr. Stone, 'is it possible to ascertain during life the relative positions and sizes of those organs to which each of the more favored faculties has been assigned 'a local habitation and a name.' Dr. Spurzheim has lately observed, 'We do not judge by the particular elevations and lumps upon the skull, but by its general development. Our adversaries are the bumpists—but no, look at the general appearance—judge for yourselves (MS. notes of lectures on the anatomy, physiology, and pathology of the brain, delivered in Edinburgh, 1828). 'What,' continues Mr. Stone, 'Dr. Spurzheim would have us to understand by this declaration, it is impossible to comprehend; for in the same course, nay, in the same lecture, he proceeded to demonstrate the individual bumps and protuberances which in fact constitute the system. Have not the phrenologists, like the aspiring giants of the olden time, piled Mount Ossa on Pelion, and Pelion on Olympus, crowded organ upon organ from the base to the vertex of the head? Have we not supposed relative positions and dimensions of these, as indicated by isolated protuberances, been taught in books, lectures, and delineated in all the phrenological busts? Have they not pretended to measure them severally and individually in living characters even to the eighth of an inch? But this is not all. In adverting to the custom which different nations have of compressing and otherwise changing the form of the head, Dr. Spurzheim remarked—'The instrument which is worn for this purpose has been brought to England; I know not exactly how long it has been used, but have heard about two years. It is curious and worthy investigation, and I would have you, should any of you have the opportunity, make this enquiry, see, when the bone is compressed, whether the brain underneath it ceases to increase in size. You may try it in animals; for, if it be the case, then we could in infancy compress the head in its different parts, and thus give a direction and development to the best and noblest facts of the human mind.'—MS. notes of lectures, delivered in Edinburgh in 1828.

'How beautiful,' says Mr. S., 'is this conception! How characteristic of the philosophy of all the phrenological speculations! When the annus mirabilis comes to pass it will be the millennium of phrenology. We shall then, indeed, hear no more of 'little lumps and protuberances,' but shall speak of the mountain of veneration being bounded on the south by the valley of amativeness, and on the east and west by the caverns of destructiveness. The ideal Republic of Plato, the Atalantis of Harrison, the Utopia of More, were all only dim and distant conceptions of that state of perfectibility of which the human mind and heart are thus supposed susceptible.'

In another part of the pamphlet from which we have borrowed this spirited extract we find a most eloquent appeal against the phrenological tenets grounded on the assumption that natural circumstances, the force of example, and the varieties of creeds, have much more to do with the excitement and manifestation of passion than have the physical construction, whether of the head or any other part of the frame. We regret that we can only extract a part of this passage.

'The organ of destructiveness, originally termed that of murder, is considered by the phrenologists as having been completely established; yet the manifestation of the feelings attributed to this faculty will invariably be found to result from those external circumstances and moral causes which alone appear to determine all the darker, as well as the brighter, traits of human character.'—

'The duty of vengeance is held to be imperative among the North American Indians. The instance is related by a traveller of a young Choctaw, who, having been reproved by his mother, 'took it so ill as, in the fury of his shame, to resolve on his own death.' He committed suicide, and his sister, being his nearest relation and thinking herself bound to revenge his loss, told her mother she had caused her brother's death, and must pay for his life. 'Whereupon the old woman resigned herself to her fate, and died by the hands of her daughter.'—Roman's Natural History of Florida. Among the Japanese the spirit of vengeance is carried so far that even the females, as well as the men, carry a dagger in their girdle, and employ it with the utmost coolness in their personal quarrels, not only against enemies and strangers, but even against their own brothers, husbands, and nearest relatives.—Taverner's Relation of Japan; Homberg's Voyages in Japan. Among the Karatschai, or black Circassiäns, a similar principle prevails. When one man has been killed by another, the relatives of the deceased consider it necessary to avenge his death by the blood of the murderer, which they conceive can alone give rest to his and their souls.—Klaproth's Travels in the Caucasus and Georgia. The superstitious notions and habits of such people, without any reference to the peculiarities of cerebral development, invariably give rise to and determine their individual dispositions. And as nations, therefore, emerge from a state of barbarity, different circumstances operating on the same constitution excite feelings and principles of an opposite description, and produce in every respect a striking revolution of character. Thus the Goths on their first invasion massacred indiscriminately man, woman, and child, and every where betrayed the most furious cruelty; but, after their intercourse with the Europeans, the same people became remarkable for their humanity.' The delight which it gave the Romans to witness the combats of the gladiators, and the cruel sports of the circus, that soil prolific in crimes which gave rise to a Nero, a Domitian, a Caligula, is afterwards adverted to, as well as those 'European sovereigns of Christian countries, over the record of whose actions the veil of humanity might well be drawn.'

'Whether at such calamitous eras, we contemplate,' says the writer, 'the demon-like Robespierre, Murat, or Carrere, resting amidst the anarchy of cruel and licentious passions; or whether we turn our eyes to the horrors of the Sicilian vespers, or the massacre of Bartholomew, and see the infuriated enthusiast committing outrageous murder within the sanctuary of the church itself; the desire and propensity to destroy will be found in every instance to be a feeling suggested and excited by the influence of incidental circumstances, and the prevailing spirit and temper of the times, rather than the result of a particular configuration and development of a certain part of the brain, urging the individual by its mechanical activity to the commission of the most atrocious crimes.'

We now proceed to extract from a writer whose opinions and sentiments will always command respect, as resulting from a mind at once highly gifted with the power of judging on abstract questions, and proverbially free from bias in favor of established principles, merely because they are established.

'While,' says Mr. Abernethy, 'I must readily concede to what is demanded in this system of organology, that the variety of effects produced may be the result of modifications of vital actions, transmitted through diversities of structure, I must strongly protest against the opinion that the organs themselves are perceptive; or, indeed, against any opinion which impugns the belief of the unity of that which is perceptive, rational, and intelligent. Many of our actions are the results of complicated thoughts and feelings, each seeming to have yielded a portion of its peculiar interests so as to produce a modified result. But how, may I ask, has this compromise been made? A gentleman once humorously answered this question by saying, that it was done by committees of the several organs, and a board of control. But if an intelligent, discretionary, and controlling power be granted, I feel no disposition to demand any more.'

'I had great gratification,' Mr. A. remarks in another part of his pamphlet, 'in being intimate with Dr. Spurzheim whilst he remained in London; and in a kind of badinage I proposed to him questions which he answered with facility, and in a manner that showed a perfect knowledge of human nature. For instance, I enquired whether he had discovered any organ of common sense; and he replied in the negative. I then demanded in what that quality consisted? and he answered, in the balance of power between other organs. This answer shows why a quality so peculiarly useful is common to all, and rare in any; for there are but few who have not prejudices or partialities, hopes or fears, or predominant feelings which prevent them from pursuing that middle and equal course of thought and conduct which unbiassed consideration or common sense indicates and directs. I enquired of Dr. Spurzheim if there was any organ of self-control, or, if not, whence that power originated? He said 'it is the result of a predominating motive; thus justice may control avarice, and avarice sensuality.' In short, I readily acknowledge my inability to offer any rational objection to Gall's and Spurzheim's system of phrenology, as affording a satisfactory explanation of the motives of human actions.'

From the avowed enemy, in the first instance, and the qualified friend in the second, to the tenets under dispute, we now turn to an article published in No. 3, of the Foreign Quarterly Review; which we regard as one of the most able expositions of the doctrine of phrenologists that ever demanded the public attention.

'The metaphysics,' says the Reviewer of phrenology, 'pretend to greater validity than all other systems, yet it is not thus that we, its votaries, maintain it, but by the relation of cerebral developement to mental manifestations. It is upon facts confirming this relation that we proceed, and the number which we have collected exceeds all belief. The collection of Dr. Gall, that of Dr. Spurzheim, of Mr. Deville, whose zeal and activity in promoting the practical part of the science cannot be sufficiently commended; those of the phrenological societies of London, Edinburgh, and many other places, contain many thousands of facts which are incontrovertible. It is not in the power of any phrenologist to irregister all living examples, but we build our pretensions upon every age of the world, and call not only moderns but ancients to our aid. As this is one of the most curious parts of our pretensions it must be briefly noticed. Every head which has been handed down to us from antiquity is in as exact conformity with our doctrine as if we ourselves had moulded it for our own purposes. The bad Roman emperors, Caligula, Nero, Caracalla, have the regions where the inferior faculties reside very much developed, while the antagonist faculties are small. The Antonines have heads that would do honor to any man. Vitellius is a mass of sensuality, deprived of all elevation. The Roman Gladiator most powerful in the basilary region has a narrow and contracted forehead, where little reason could reside. In Homer the development of ideality is immense, and still greater perhaps in the rapturous Pindar. In Demosthenes there is a fine show of the superior faculties, but the organ of language is not the most prominent, neither were the natural command and flow of words the characteristics of his eloquence. His desire of gain too is largely developed. The head of Socrates is such as Drs. Gall and Spurzheim would model to demonstrate the organ of marvellousness, and a mind of visions; and so is a head more modern, that of Torquato Tasso. The head of Zeno is that of a profound and moral thinker, as he was. That of Seneca has much bad but more good, so balanced that a struggle between them will be necessary, but the latter will generally prevail. The head of Cicero, larger on one side than the other, has more language than Demosthenes, with large reflecting faculties, vanity, the desire of gain and of fame, and cautiousness, great with little hope, and little courage. In short, the example of antique statues in our favor are innumerable. Now, either these heads are genuine casts, or they are not. If casts, their perfect coincidence with the respective characters most phrenologically proclaims, what all men, indeed, long since have known, that nature has acted in all ages by immutable laws. If they are not casts, but ideal heads, then the ancients had observed the fact that a certain form of head regularly accompanied such a power of mind; and their sculptors, without accounting for it, registered it in their works.'

We now proceed to a more regular development of the subject before us; and the order we intend to pursue is, first to give a brief history of the circumstances which led to the conception of the organological hypothesis, then describe the present condition of the assumed science, engage in an investigation of the arguments for, and objections against, its becoming substantively as a body of legitimate doctrine; and conclude with a few corollaries containing our own inference.

'In the ninth year of my age,' says Dr. Gall, 'my parents sent me to one of my uncles, who was a clergyman in the Black Forest, and who, in order to inspire me with emulation, gave me a companion in my studies. I was, however, frequently reproached for not learning my lesson so well as he did, particularly as more was expected from me than from him. From my uncle we were both put to school at Baden, near Rastadt, and there, whenever our task was to learn by heart, I was always surpassed by boys who, in their other exercises, were much my inferiors. As every one of those who were remarkable for this talent had large and prominent eyes, we gave them the nick-name of ox-eyed. Three years after this we went to school at Bruchsa, and there again the ox-eyed scholars mortified me as before. Two years later I went to Strasburgh, and still found that, however moderate their abilities in other respects, the pupils with prominent eyes all learnt by heart with the greatest ease.

'Although,' continues our author, 'I was utterly destitute of previous knowledge, I could not help concluding that prominent eyes were the mark of a good memory; and the connexion between this external sign and the mental faculty occured to me. It was not, however, till some time afterwards that, led on from observation to observation, from reflection to reflection, I began to conceive that since memory has its external sign the other faculties might very well have theirs. From that moment every person remarkable for any talent, or for any quality, became the subject of new attention, and all my thoughts were directed to a minute study of the form of their heads. Little by little I ventured to flatter myself that I could perceive one constant shape in the head of every great painter, of every great musician, of every great mechanic, severally denoting a decided predispositioh in the individual to one or other of these arts. In the mean time I had begun the study of medicine, where I heard much about the functions of the muscles, of the viscera, &c., but not a word about the functions of the brain. My former observations then recurred to me, and led me to suspect, what I afterwards proved, that the form of the skull is entirely due to the form of the viscus which is contained in it. From that instant I conceived the hope of being able one day to determine the moral and the intellectual faculties of man, by means of his cerebral organisation, and of establishing a physiology of the brain. I therefore resolved to continue my researches until I should obtain my object or find it impossible. The task would have been less difficult had I abandoned myself entirely to nature. But I had already learned too much of the errors and prejudices then taught upon those subjects not to be biased by them, and I was still farther entangled by the doctrines of metaphysicians, who teach that all our ideas come by our senses; that all men are born alike, that education and accident alone make them differ. If this be true, said I, no faculty can have an external sign, and to study the brain in parts and its functions is absolute madness. Still I remembered my former observations; I knew that the circumstances in which my brothers and sisters, my school-fellows, my playmates, had from their infancy been placed were all alike. I saw that education was bestowed in vain on some persons, that others had talents without it. I observed a proportionate variety in the disposition of animals. Some dogs are born hunters, while others of the same litter cannot be taught; some are peaceful, some ill-tempered. In birds there is a similar diversity. The whole animal kingdom spoke then in favor of my strong surmises, and I resolved to prosecute my plan. It was not till thirty years had been spent in uninterrupted study in observing men of every description, and in many countries, men remarkable for some talent or some defect, for some vice or some virtue, in studying inferior animals, domestic or wild, the inhabitants of air or of earth, that I ventured to embody my observations, and publish them in one comprehensive work.'

In Dr. Spurzheim's physiognomical work, published several years since, we find a collection of facts, some almost exceeding belief, illustrative of the principles both of the variety and inconsistency of the human character—by inconsistency we mean, that talents and virtues are manifested by some individuals, accompanied by the negation of other faculties, which, à priori, we should suppose to be their accompaniments; or the display of opposite qualities which renders the totality still more remarkable. We are told, for instance, of a virtuous, and humane, and benevolent individual, delighting in the murderous horrors of war, and becoming chaplain to a regiment in order to give him the chance of witnessing these sanguinary spectacles. Of another person we read, who at the same time was gifted with such high religious impressions and such thievish propensities that, in the voluntary act of confessing and deploring to his spiritual director 'his natural tendencies,' he was found in the act of stealing the confessor's watch! Such and many more marvellous inconsistencies of character and conduct will be found interspersed among the writings of Spurzheim and other of the phrenologists; but any man of the most slender observation, and who has the smallest correspondence with the world, will have constantly before him examples enough of this variety and inconsistency.

It would be out of place to enter minutely into the very curious process of organic evolution from the primordial germ. Under the word BRAIN we have already adverted to it, and shall have occasion to treat of it more fully when writing the article PHYSIOLOGY. It may suffice here to state that, although much remains to be known on the growth of brain, nerve, and bone, it is sufficiently manifest that nervous and membraneous matter take the precedence of osseous formations, and that the evolution of brain is not interfered with by bony casement, but that the ossific deposit waits to be directed by cerebral expansion; and that the hardening of the skull is subsequent to, and, as we have said, directed by, the organisation of the nervous system; of which system even the brain itself is the last to be fully formed. It may here, however, be further just intimated, that the bony envelopment of the brain, or, as we commonly express ourselves, the skull, consists of two layers, and that the outer and inner surface are not in all instances and at every part completely in correspondence. This fact has, indeed, been brought forward in disproof of craniological pretension; but, as we are not yet on the head of objections to the system, we must for the present defer any other remarks in reference to this particular.

It is now time that we state what we have just called the topography of this system of organology, or in other words mention the different localities of the different powers which have been determined on by the two great promulgers of the doctrine. Here we extract from one of the reviews before us; but the reader may depend upon the accuracy of the statements; and we rather prefer borrowing from the later publications than extracting from the original works themselves, on account of the somewhat fluctuating state of the pretended science (we must not assume its validity), and the consequent variations of nomenclature and position that are occasionally introduced into its terminology. Indeed we shall find that Gall and Spurzheim do not entirely agree in all particulars, either as to place or name.

To the list given by Dr. Spurzheim, we shall add from the work of this author, which the reviewer has neglected to do, the part of the brain in which the faculties are supposed to reside.

DR. GALL'S DIAGRAM, WITH THE GERMAN NAMES TRANSLATED.

No. 1. *Zeugungstrich.* The instinct of generation.
2. *Jungerliebe, Kinderliebe.* The love of offspring.
3. *Archanglichkeit.* Friendship, attachment.
4. *Muth, Raussinu.* Courage, self-defence.
5. *Würgsinu.* Murder, the wish to destroy.
6. *List, Schlauheit, Klugheit.* Cunning.
7. *Eigenthümsinn.* The sentiment of property.
8. *Stolz, Hochmuth, Horschsucht.* Pride, self-esteem, haughtiness.
9. *Eitelkeit, Rhumsucht, Ehrgeitz.* Vanity, ambition.
10. *Behütsamkeit, Vorsicht, Vorsichtigkeit.* Cautiousness, foresight, prudence.
11. *Sachgedächtniss, Erziehungs, fähigeit.* The memory of things, educability.
12. *Ortsinn, Raumsinn.* Local memory.
13. *Personensinn.* The memory of persons.
14. *Wortgedäcthniss.* Verbal memory.
15. *Sprachforschungssinn.* Memory for languages.
16. *Farbensinn.* Colors.
17. *Tousinn.* Music.
18. *Zahlensinn.* Number.
19. *Kunstsinn.* Aptitude for the mechanical arts.
20. *Vergleichender Scharfsinn.* Comparative sagacity, aptitude for drawing comparisons.
21. *Metaphysicher Tiessin.* Metaphysical depth of thought; aptitude for drawing conclusions.
22. *Witz.* Wit.
23. *Dichtergeist.* Poetry.
24. *Gutmüthigkeit, Mitleiden.* Good nature.
25. *Darstellungssinn.* Mimicry.
26. *Theosophie.* Theosophy, religion.
27. *Festigkeit.* Firmness of character.

Dr. Spurzheim's arrangement of faculties is comprised in orders, genera, &c.; they are:—

Order I.—Feelings, or Affective Faculties.

Genus i. Propensities. No. 1. *Amativeness.* Situated in the neck. Discover the mastoid process behind the ear, and the protuberance of the occipital spine above the middle of the neck, the space between these two elevations indicates the extent of this organ. No. 2. *Philoprogenitiveness.* Protuberance upon the posterior part of the skull. No. 3. *Inhabitiveness.* No. 4. *Adhesiveness.* Lying on the lateral and back part of the head. No. 5. *Combativeness.* On that part of the head which corresponds to the posterior inferior angle of the parietal bone, behind the mastoid process. No. 6. *Destructiveness.* On the side of the head, immediately above the ears. No. 7. *Secretiveness.* In the middle of the side of the head, above the organ of the propensity to destroy. No. 8. *Acquisitiveness.* At the temples, on the anterior inferior angle of the parietal bone. No. 9. *Constructiveness.* Development of the brain at the temples.

Genus ii. Sentiments. No. 10. *Self-esteem.* An elevation in the midst of the upper posterior part of the head. No. 11. *Approbativeness.* 'Development of the upper posterior and lateral part of the head is observed in persons who are very fond of being caressed, honored, and applauded; in short, who are ambitious.' No. 12. *Cautiousness.* Cautious persons are extremely large on the upper posterior part of both sides of the head.

Genus iii. Superior Sentiments. No. 13. *Benevolence.* Superior middle part of the forehead elevated and prominent. No. 14. *Veneration.* Head generally elevated in the middle of its upper part. No. 15. *Firmness.* 'Dr. Gall observes that persons of a firm and constant character have the top of the brain much developed.' No. 16. *Conscientiousness.* On the side of the organ of firmness. No. 17. *Hope.* On the side of veneration; as is No. 18. *Marvellousness.* No. 19. *Ideality.* An enlargement above the temples in an arched direction. No. 20. *Mirthfulness,* or gayness. No. 21. *Imitation.* An elevation of a semiglobular form at the upper part of the forehead.

Order II. Understanding or Intellect. External Senses, Feeling, Taste, Smell, Hearing, Sight.

Genus ii. Perceptive Faculties. The intellectual faculties which perceive the existence of external objects, and their physical qualities. No. 22. *Individuality.* Lower part of the forehead very prominent, indicating a development of the anterior inferior part of the brain. No. 23. *Configuration.* 'The organ of form seems to be placed in the internal angle of the orbit.' No. 24. *Size.* Near the former. No. 25. *Weight.* In the neighbourhood of form and size. No. 26. *Color.* 'The external sign of a great development of the organ of this faculty is a vaulted and round arch of the eyebrows.

Genus iii. Intellectual Faculties which perceive the relations of external objects and their physical qualites. No. 27. *Locality.* 'At the eyebrows, toward the middle line of the forehead, a protuberance on each side reaching to the middle of the forehead.' No. 28. *Calculation.* 'In calculating individuals the arch of the eyebrows is much depressed or elevated at the external angle of the orbits, proving a greater development of brain behind this place.' No. 29. *Order.* 'Its organ is probably situated outward, not far distant from the organs of size and space.' No. 30. *Eventuality.* No. 31. *Time.* Between the organs of individuality, space, order, time, and cause. No. 32. *Melody.* 'A great development of this organ enlarges the lateral parts of the forehead.' No. 33. *Language.* Prominence of the eyes.

Genus iv. Reflective Faculties. No. 34. *Comparison.* An elevation in the middle of the upper part of the forehead, presenting the form of a reversed pyramid. No. 35. *Causality.* 'The superior part of the forehead much developed, and prominent in a hemispherical form.'

As an apology for his nomenclature Dr. Spurzheim introduces the following remarks in the preface to his physiognomical system. 'Having formed new names, it is my duty to state my reasons for so doing. The English language presents very few single words which express my conception of the peculiar faculties of the mind. Hence I was obliged to speak either by circumlocution, or to make new names. Now I think, with Locke, that in this respect we have the same right with our predecessors, and I therefore propose new single names, which I have formed as much as possible conformably to the spirit of the language. Having established different propensities as peculiar faculties of the mind, in order to designate propensity I have taken the termination *ive* as indicating the quality of producing, and *ness* as indicating the abstract state; I have therefore joined *iveness* to different roots, among which I have given the preference to English words generally admitted. When I could not find such, I chose Latin participles, which in English are so common, even in expressions which denote a meaning similar to that which I look for, as destructiveness, productiveness, &c.'

We shall conclude this part of the subject by extracting the following remarks of Dr. Elliotson on the general and relative localities of the organs and faculties:—

'The exact situation of the organs,' says Dr. E., 'can be learned from drawings or marked heads only. I shall therefore confine myself to remarking, 1. That the organs of the faculties or qualities common to man and brutes are placed in parts of the brain common to man and brutes, at the inferior posterior, the posterior inferior, and inferior anterior parts of the brain, i. e. of the instinct of propagation, the love of offspring, the instinct of self-defence, of appropriating, of stratagem, &c. 2. Those which belong to man exclusively, and form the barrier between man and brutes, are placed in parts of the brain not possessed by brutes, viz. the anterior superior, and superior of the front, i. e. of comparative sagacity, causality, wit, poetic talent, and the disposition to religious feelings. 3. The more indispensable a quality or faculty, the nearer are its organs placed to the base of the brain, or medium line. The first and most indispensable, the instinct of propagation, lies nearest the base; that of the love of offspring follows. The organ of the sense of localities is more indispensable than that of the sense of tones or numbers; accordingly the former is situated nearer the medium line than the two latter. 4. The organs of fundamental qualities and faculties which mutually assist each other are placed near to each other, i. e. the love of propagation and of offspring, of self-defence, and the instinct to destroy life, of tones and numbers. 5. The organs of analogous fundamental qualities and faculties are equally placed near each other; i. e. the organs of the relations of places, colors, tones and numbers, are placed in the same line as well as the organs of the superior faculties, and the organs of the inferior propensities.'

'Although,' continues Dr. E., 'the arrangement of the organs is so beautiful, we must not imagine that Gall mapped out the head at pleasure, according to preconceived notions. He discovered one organ after another, just as it might happen, and often one became known to him situated very remotely from the organ last discovered. The set of organs discovered by him turned out as it is, and a strong argument is thus afforded to the truth of his system.' 'I defy,' says he, 'those who attribute my determination of the fundamental faculties and of the seat of their organs, to caprice or arbitrary choice to possess a tenth part of the talent necessary for the most obscure presentiment of this beautiful arrangement, once discovered, it displays the hand of God, whom we cannot cease to adore with wonder increasing as his works become more disclosed to our eyes.'

In the allusion we have above made to the *anatomical* or physiological part of the organic system of Gall and Spurzheim, it was stated that although the gradual evolution of the brain regulated the form and size of its bony covering, the skull, this same skull consists of two layers or tables, as anatomists express themselves, which are separated from each other by a reticular network, which is interposed between them. Now, were these two tables always in complete parallelism, the circumstance of there being two would not affect cranioscopical inference, but as this is not precisely the case, even by the confession of the organists, the objectors to the doctrine think themselves entitled to be heard when they advance the want of correspondence between the outer and internal layer of bone, in proof that the exterior elevation, or depression, or expansion, cannot be taken as a correct index of the direction and form of the brain immediately under the protuberance.

In reply to objections of this kind, and in allusion to the two bony layers of which we are now speaking, Dr. Spurzheim expresses himself in the following manner:—'These two tables are scarcely perceptible in children, they are distinct in adults, but their distance one from the other is not very considerable. In general, from birth to the period when the brain begins to diminish in size, it is possible and easy to distinguish the size of the brain by considering the size of the skull. For there never is an empty space between the skull and the brain, and both tables are not distant enough to invalidate our assertion. It is objected that both tables are not parallel, and that for this reason it is impossible to measure the size of the brain and its parts, according to the size and form of the skull. This objection falls to the ground as soon as our method is known. It is not necessary to appreciate the minute difference of size, in order to distinguish the development of the organs. These occupy a large surface, and they present a very different size from the lowest to the highest degree of development.' It is also to be considered that we only intend to distinguish the size of organs, and that it is essential not to confound this idea with that of protuberances. If one organ be much developed, and the neighbouring organs very little, the developed organ presents an elevation or protuberance; but, if the neighbouring organs are developed in proportion, no protuberance can be perceived, the surface is smooth. Now this may happen if the organs are much or little developed. Every individual has all organs; and it is only to be determined whether the whole brain, or one, or several parts are more or less developed.

There is another anatomical difficulty, which we believe in the general way is considered more formidable than the one above announced, we mean that of the frontal sinuses.

'It is of considerable importance to ascertain how far these sinuses generally extend, and how many of the phrenological organs they generally affect. This question is easily determined by an appeal to fact. A considerable number of crania have lately been opened with this view, and it appears that the frontal sinuses extend over a greater surface than has hitherto been supposed. Sir William Hamilton, in a lecture at the Edinburgh University, exhibited the open crania belonging to that museum, with a number of other specimens, and thereby demonstrated that these sinuses, which are very unequal in their extent and depth, affect frequently as many and often more than one-third of the principal phrenological organs; and that the retirement of the internal table, from the irregularities and protrusions on the external, is so considerable as to render it impossible to discover by any external manipulation the general size and development of the particular parts of the brain.'

Mr. Combe, perceiving it necessary to make some reply, delivered a lecture on the same subject in the Edinburgh Assembly Rooms, producing all the counter specimens he could find. As this question is one which must be *ultimately* decided by the number of facts brought forward, and as Sir William Hamilton's collection of crania was so very extensive, it was incumbent on the phrenologists to bring into the arena, not only the *select* specimens which they have been gathering in their own museum, but as many other examples as they could possibly collect. Mr. Combe, aware of this fact, has announced to the public that he triumphantly refuted Sir William Hamilton's demonstration, not simply by the collection of skulls from the Clyde Street Hall, but by the whole of the open crania from a private museum.

We suspect there must be some misunderstanding or misrepresentation in reference to the particulars of this lecture; for Mr. Stone declares the additional skulls to have consisted only of that of an infant two years old, and two of full grown persons. Mr. Combe (who beside the guarantee which general respectability of character gives against any unmanly subterfuge, is proverbially a candid and impartial advocate) would never, we should conceive, have been desirous of deceiving the public by intimating that he was speaking of a considerable collection, which only in point of fact consisted of two and a half.

With respect to the objection itself of the frontal sinus, we shall allow Dr. Spurzheim again to speak. 'Our adversaries say that, on account of the frontal sinuses, the organ of space cannot be distinguished. The development of this organ, however, and the frontal sinuses, present quite different forms; the frontal sinuses only form a bony crest, and the isolated protuberance which indicates the particular development of the organ of space is round and large. Sometimes the organ of space is very considerable, and at the same time there are frontal sinuses; then the bony crest is perceived, and at the same time this part of the forehead is prominent.' He has subsequently said, as reported by Mr. Stone, that 'the frontal sinuses are generally wanting in children and young persons, and adults, and that they occur only in old persons, or after chronic insanity.' 'The absence of the sinuses,' Mr. S. replies, 'in young and adult persons is, on the contrary, exceedingly rare; so much so as to have escaped the observations of Palfin, Bertin, Portal, Soemmering, Caldani, and other anatomists.'

Another anatomical objection has been urged against the system, inasmuch as the organs are not confined to the surface of the brain, but extend allowedly through its whole mass. To this objection Dr. S. replies, 'true it is the organs are not confined to the surface of the brain; they extend from the surface to the great swelling of the occipital bole (medulla oblongata), and probably to the commissures; but, as the peripheric expansions of the five senses indicate the development of the respective nerves, so the convolutions of the brain denote a larger or smaller development of the whole cerebral mass. This will be understood by analogy. Animals which have a large external apparatus of smell, large nostrils, large turbinated bones, a large expansion of the pituitary membranes, consequently a very considerable nervous expansion, have the whole olfactory nerve very much developed; and it is possible to measure the development of the nerve in general according to its peripheric expansion.'

Comparative anatomy has been brought to bear against cranioscopical pretence. Allowing it is urged that the less complicated organisation of the cranium in man than in animals, and its less dependence upon the facial bones, may give room for supposing that the size and form of the brain can be judged of from the external configuration of the skull; yet this cannot be the case in the inferior animals, since their crania are often so formed that the greatest prominences of bone are answerable to those very parts in which the brain is the least developed. 'In the lion, tiger, wolf, &c., the temporal bone is externally most depressed over the part where the subjacent brain is most fully developed; and the zygoma of the bone is prominent in those animals, and extends over the part where it is least developed.' Granting, say the phrenologists in reply, that such is the case, conceding that the cranioscopical difficulties may be greater in one race of animals than in another, yet we find the argument good in all so far as it does extend, and where the brain's development is displayed by the exterior shape and size of parts; thus will the doctrine be found illustrated even among the brute creation. The courageous animals, Dr. Spurzheim tells us, even without reference to their size or kind, 'have the head between and behind the ears very large.' This is an unfailing sign to distinguish or recognise if a horse be shy and timid, or bold and sure. The same difference is observed in game cocks and game hens in comparison with the domestic cock. 'Fighting cocks,' he adds, in another place, 'are less than dunghill cocks, and hares are stronger than rabbits, though less courageous;' so that courage does not depend upon, or show itself necessarily connected with, magnitude and strength.

The *pathological* weapons with which phrenology has been combated appear to be of the most formidable kind. How is it possible, consistently with your tenets of an organ for this and an organ for that faculty, that the brain should sometimes be wounded, part of it torn away, extensively diseased, occasionally ossified throughout its whole extent, or dissolved in water, as in cases of chronic hydrocephalus? How is it possible, the anti-phrenologists say, that all these things should occur and the manifestation of faculties continue through life, as if nothing had happened to one or several of your assumed organs, while upon your own principles these should not only be injured but actually destroyed?

Your arguments, say their opponents, prove too much, and you must give up your own notion of the brain being at all necessary in the manifestation of mind, before you can ground any valid objection to the phrenological doctrine, on the principle that morbid conditions of the cerebral organ may exist without the lesion being always manifest by those marks which one should suppose must of course stamp the nature of the received injury. And in truth the pathologist and medical practitioner meet with a great deal in this way which is exceedingly mysterious and puzzling upon any hypothesis of cerebral condition. Nor is it in the brain alone that these pathological puzzles are often presenting themselves; and we have just popped upon a paragraph, in turning over the pages of Spurzheim's book, which we may as well extract as express the same thing in our own words—'It is true,' says he, 'that very considerable injuries of the brain produce sometimes very slight perturbations in the manifestation of the mind, and that very slight injuries of the brain are accompanied often with the most violent accidents. But this also happens in other parts of the body. Sometimes very considerable abscesses are found in the lungs without a considerable preceding derangement in the respiration. Are not the lungs, therefore, the organ of respiration? Sometimes ossifications are observed in the heart without any remarkable disturbance of circulation; is not, therefore, the heart the organ of circulation? Hence it is wrong to attribute to the wound, or to its seat, what must be attributed to the particular irritability of the sick person. Thus we may explain why often no accident results from a very considerable wound of the brain; namely, in patients whose irritability is very weak; while in very irritable persons, very slight wounds produce the most serious consequences.'

Then, again, the organologists urge the vague and marvellous way in which most of the tales of morbid condition of brain are told.

'If,' say Drs. Gall and Spurzheim, and their associates, 'all these observations were as correct as their authors state them to be, not only phrenology would be subverted ab imo fundo, but it would be impossible to maintain that the brain performed any intellectual functions, or indeed any functions except that of terminating the columnar structure of man with a round nob, on which Quakers hang broad brimmed hats. Were the mass, said to be fibrous, converted to bone without a loss of any faculty, vital, animal, intellectual; were it really liquid and addled as it then might be, and no thought or action weakened, this surely is the irresistible consequence. But the vague and indefinite manner in which all these examples are produced save the head and its contents from the imputation of being useless appendages, and give phrenology a chance of a little longer life than its opponents wish. In order to ascertain whether an injury done to any material organ is followed by the disease of any function, the direct method is, to observe whether the function attached to that organ is diseased or not. Thus let loco-motion be supposed to depend upon the soleus maximus muscle; to ascertain this we should observe whether, when this muscle is injured, the power of loco-motion be impaired or not. The same process should be followed with the brain; if an ounce or two of the organ of cautiousness be carried away, as in one case it seemed to have been, we should not examine whether the faculty of music, or eventuality, had been diminished or increased, but whether the poor patient were more or less cautious than he was before. What we do maintain is that our predecessors and opponents did not possess the due means of observing the facts which they have stated; for, instead of looking to the faculties which we attach to the injured part above quoted, they endeavour to find there not merely powers which do not belong to those parts, but powers which we do not allow to exist in man as simple fundamental faculties, perception, memory, judgment, imagination, &c. These indeed, as understood by the doctors of the old school, may very well survive a partial lesion of the brain.'

Another loop-hole, as it would be called by their enemies, do the phrenologists employ in endeavouring to get through the difficulties of cerebral lesion, unattended with corresponding injury, namely, the duplicity of the nervous system with the brain at its head. Let the whole side, they say, of the head be involved in disorder, yet, if the opposite side maintain its integrity, the individual may continue to preserve and manifest the faculties of the parts without much observable difference in power, just as the faculty of vision is maintained after the loss of one eye. We are told, indeed, by Spurzheim some rather curious tales in illustration of this principle, and such as, were we decidedly friendly to one side of the argument in the way of partizanship, we should be rather inclined to keep in the back ground of the phrenological picture. However, one of them which strikes us, and will strike our readers, as the most marvellous, is not given by Spurzheim himself, but by another anatomist of celebrity who knew nothing of the doctrine now canvassed. Spurzheim says 'it is evident that both hemispheres of the brain may be in a quite different or even opposite state. Tiedeman relates the example of one Moser who was insane on one side, and who observed his madness with the other. Gall attended a minister who had a similar disease for three years. He heard constantly on his left side reproaches and injuries; he turned his head on this side and looked at the persons. With his right side he commonly judged the madness of his left side; but sometimes in a fit of fever he could not rectify his peculiar state. Long after being cured, if he happened to be angry, or had drunk more than he was accustomed to, he observed in his left side a tendency to his former alienation.' 'Every organ, every member of the human body,' says our reviewer, 'is double, and has long been acknowledged to be so. The fact has been doubted only since it became necessary to oppose phrenology.'

In the few words we have to spare on the *metaphysical* part of the argument, we must get the reader to revert to some of the quotations which have been introduced at the threshold of the present disquisition, and call his attention especially to that extract from Dr. Gall which traces the first conception of the phrenological scheme from the difficulty he (Gall) found in explaining the fact, that some boys whom he knew to be his inferiors in many things, were vastly his superiors in others; these instances are presenting themselves in abundance every day before persons who take the smallest pains to make any observation on character, and as long as we ourselves can recollect thinking on the subject of our own consciousness, its modes and manifestations, we remember to have been impressed with this difficulty on the hypothesis of general powers and leading fundamental faculties.

Were memory, general memory, a simple fundamental faculty, these partialities, if we may so say, which so frequently occur in the manifestation of its power would not be perceived; for be it observed it is not only those things which highly gifted individuals do not care about that they do not remember; but the very impotency of the attempt to recollect seems sometimes proportioned to the desire in persons to recal the impression originally made, while other things, respecting which they are comparatively indifferent, rush upon the attention, become parcel of the mind, and are susceptible of recal by the slightest effort. 'How is it,' said Gall when a young boy to one of his school-fellows, 'that you contrive to find your way so easily through intricate places, through which you have only once been?' 'How is it,' retorted his companion, with the same feelings of surprise, 'that you contrive not to find yours?'

In respect to judgment the diversity is precisely the same, and even perception itself shall differ in a measure quite inconsistent with the assumption of general quantum of intellect in the perceiving person. To talk of accidental circumstances directing or creating an ear for sounds were surely to talk at random, and there is now living a prelate whose perception of music is of the nicest and most critical kind, but who is so deficient in the faculty of distinguishing colors that it constituted one of the pastimes of his children, when they were young, to place bodies before his eyes of different hues, that they might be amused with his mistakes; and yet this individual has, or had at the time we are speaking of, strong and correct vision. We recollect the late Dr. Gregory used to surprise his pupils by saying in his lectures, that what seemed evident to all others almost, was far from being so to him: viz. the fluctuation in abdominal dropsy; and, were we to add one instance to another as they occur to our recollection, we might fill page after page with recitals of what after all would but confirm a principle, or rather establish a fact, that stands in no need of confirmation or substantiating.

What do they prove? is the only matter that becomes a question; and to this it is difficult to give a reply that shall satisfy the enquirer whose object in putting the question is to find the truth at any rate; the phrenologists urge that the facts are inconsistent with those theories of mind which suppose perception, memory, judgment, imagination, are abstract and simple and fundamental faculties; and it is a curious fact that one of the most able reasoners who ever ventured into the regions of metaphysics has been successfully engaged almost simultaneously with the labors of the phrenologists in opposing these assumptions and abstractions even of the common sense school of metaphysics. Dr. Brown, versus Reid and Dugald Stewart, is almost the same thing as Drs. Gall and Spurzheim, versus the old metaphysico-physiologists, only that in the former case organology is not adverted to, while in the latter it is fons et origo omnium.

The unity of consciousness and the necessity of some pervading principle to insure personal identity are the principles which the anti-phrenologists assume to be quite inconsistent with the exercise of those several perceptibilities which are assumed on the other side; and they contend that perception, and judgment, and memory, must be regulated by certain laws, without reference immediately to the thing perceived, or judged of, or recollected, otherwise man would indeed be a bundle of inconsistencies, and no totality of thought, of feeling, of consciousness, could ever have place. Something like a statement of this kind will be found in an extract which we have already submitted from Mr. Abernethy's pamphlet.

Insanity has been urged both by the phrenologists and the anti-phrenologists as decisive in favor of their respective causes. How, will the latter set of men urge, can you make tally with your wild assumptions of separate organs for separate faculties the fact that the most trifling circumstance of excitation, that is trifling in itself and only formidable in its connexion and consequences, will prove sufficiently potent to drag steady reason, precipitately and in a moment, from its seat, and place in its stead the wildest, vagaries, and most unstable principles of thought and action. 'Il ne faut', says a French writer, 'qu'un atome deplacé pour te ravir cette intelligence dont tu parois si fier;' and even this displacement of an atom as a primary cause does not seem to be in all cases necessary; for mere mental circumstances will at times avail for the production of the highest and most permanent derangement.

Dr. Reid relates the case of a young lady who was one morning requested by her mother to stay at home; notwithstanding which she was tempted to go out. Upon her return to her domestic roof, she found that the parent whom she had so recently disobliged had expired in her absence. The awful spectacle of her mother's corpse, connected with the filial disobedience which had almost immediately preceded, shook her reason from her seat, and she continued ever afterwards in a state of mental derangement. Hill, in his treatise on insanity, speaks of a young lady, who, on her way to the post-office to enquire for letters from her lover, heard of his having suddenly died or fallen in battle (we quote from memory, and without much of the faculty of memory for things): but the consequence was confirmed insanity, and for years to come she went daily to the same post-office with the same fruitless enquiry.

Now, in what way can these sudden impulses with all their dread and complicated results be brought to harmonize with the position that assumes one organ for one faculty, and another for another, to a very large amount? Here is a blow hitting merely the thoughts and affections, but at the same time hurling to the dust all your twenty, or thirty, or forty organs, with all their appurtenancies and peculiarities.

Stop, say the phrenologists in reply, while we argue for the existence and operation of the several organs and faculties, we maintain that, for harmony of intellect and consistency of character, there must be an harmonious relation the one to the other, and that the temporary or permanent abolition of one or another will set all going wrong, just as the taking away a part or piece of complicated machinery shall necessarily interfere with the adjusted and regular motion of the whole. That he who says the organ of amativeness, must be sliced, or cut, or torn, or inflamed, or even excited or depressed before a person can go mad from love, assumes something which our theories do not permit him to assume. It is quite enough that any other organ or organs be deranged, either in their structure or functions for this effect to to be produced; but the turn that the madnesss shall take will most likely be directed by that passion or sentiment which happened to be uppermost in the mind or brain of the individual at the moment when the impulse that overturned the reason made its rush upon the frame. It is further maintained by many of the phrenological school, and they assert that actual observation both before and after death shows the organ in many cases to be the seat of the morbid action; whose healthy workings give a character to the individual, but whose disordered condition imparts a character to the insanity.

With respect to the objections on the score of *morality* which have been propounded, the organological advocate enquires, Will you, can you deny, that in two individuals, virtuous inclinations, or vicious propensities are greater ab origine, and that consequently the vice of the one, and the virtue of the other, are in some measure constitutional? and whether does it matter that such inherent quality be traceable to brain formation, or be in some other inexplicable way connected and interwoven with the body and mind of the individual? It matters, rejoins the anti-phrenologist, in this way; that in one case, though the disposition or natural tendency to vice be great, there is connected with it a perception and allowance of virtue, and a freedom of will in choosing or refusing to listen to the commands of virtue; while, on the other, necessity and organisation are the commands to be obeyed, and if the organ of murder be of a given magnitude and strength it is that, and not the man, that plunges the dagger of death into the bosom of man. No such consequence by any means follows from our doctrine, say the supporters of phrenology; for besides that it is forming an erroneous estimate of our principles to suppose that magnitude of one organ determines the character, unchecked and unmodified by other sentiments and motives, the murderous act should be no more charged upon the organ of murder in our system, than it should be placed to the account of tendency or disposition in yours. All things flow from the will of the Almighty, so that, at least, without it nothing can be. Now, whether his pleasure be that good and evil, that the mingled nature of man, should be inherent in human organisation, or should exist independently of it, the fact of their existence is constant; the means alone are different. Whether it be by the fibres of his brain, or by his essential nature, that the created being becomes the perpetrator of harm, harm is not more or less his act—his lot. Whatever is, is by the will of God. If the will of God be fate; every doctrine which admits a God, endowed with will, as ruler of the universe, is fatalism; and divines and moralists are fatalists as we are. If too the influence of the Creator over human thoughts and actions be fatalism, it is fatalism whether exercised by spirit or by matter.

Whether then the system of phrenology leaves the doctrines of fate and necessity just as it found them, we leave for others to determine; we shall merely add, that all systems which endeavour to reconcile the necessity of actions with the free will and responsibility of man are necessarily in their nature nugatory. All men sufficiently know the fact, whether they be materialists or immaterialists, organologists or mentalists; but all ought at the same time to know that every other appeal than that to 'the man within the breast,' to the consciousness and conscience of the individual, is worse than nothing. No organic or anti-organic speculations will do; no fearful presentiments of the consequences of truth being ascertained in any way, and to any extent, will avail; no immaterial physiology, forced from an university professor, by virtue of his office, will answer; no, it must be by alarming the conscience, and resorting to the motives of love and of fear, by letting the physiological champions fight their own battles, and by wielding other weapons than those with which an earthly warfare is waged, that the individual or individuals can expect to succeed who stand as messengers of peace or of woe between man and his Maker. 'All theory,' says Dr. Johnson, 'is against the freedom of the will; all experience for it. We know that we are free, and there's an end of it.' Without professing to advocate phrenology on this, or indeed on any other ground, we have thought it right to say thus much on the score of alleged consequences; and we think it right further to state, that, whether consistently or not with their positions and tenets, the phrenological writers and teachers all along urge the vast importance of aiming to correct and to combat vicious speculations.

We will add, although not ourselves unqualifiedly disciples of the cerebral philosophy in question, most of our friends who are so, are at the same time men who as unhesitatingly avow their respect for, and confidence in religion as a source of morality. We recollect a near relation returning from Scotland some time since with a simultaneous conviction that the doctrines taught by the phrenologists, and the doctrines taught by Dr. Chalmers, were, the former founded in nature and truth—the latter, the truth itself. By this association of inferior and higher things, it will be sufficiently evident that we mean nothing disrespectful; our only aim and wish being that of freeing a system, which may or may not be correct, from the unmerited obloquy of some who malignantly, and therefore improperly, oppose it.

But it is time to come to our last particular, that of the collocation of facts; and here one might imagine the matter would end. By this appeal one should suppose the question would speedily be set at rest, and the examiner would it might be thought succumb to testimony who should refuse to be convinced by argument. Unfortunately however, facts in philosophy, that is in disputed philosophical creeds, are like facts in medical science, convincing or not, according to the conceptions and belief of the persons who are called upon to witness them. It will be amusing, and we should hope instructive, to the reader to have presented before him the same example from an enemy and a friend to the cause of craniology, in the instance of an individual whose history and fate made but a very short time ago considerable noise in the world: we mean Thurtell, the murderer of Weare.

'It is really impossible to look at the development of Thurtell,' says Mr. Stone tauntingly, 'and seriously believe he murdered Weare; the poor man must surely have been innocent, and executed by mistake, for he possesses the organ of adhesiveness, which disposes to 'fervour and constancy of affection' very large, and it is unlikely, with such a development, that he would have murdered his friend; that of veneration which gives rise to 'religious sentiments,' and 'respect and deference to persons' large; and benevolence, the source of every generous feeling, very large. How is it possible, therefore, to reconcile these indications with his real character? The difficulty is solved by the phrenological report, which shall speak for itself. 'The murder committed by Thurtell was a predetermined cold-blooded deed; nothing can justify it. Revenge against Weare for having gambled too successfully, and, as he imagined, unfairly with him, prompted it; but there is every probability that Thurtell laid the unwarrantable unction to his soul, that he would do a service to others by destroying Weare. He considered Weare as a complete rascal, one who had robbed many as well as himself, and one who, if he lived, would have robbed many more.' Thus the organ, continues Mr. S., is made to excite the organ of murder, and the phrenological deduction is characteristic of all the beauty, excellence, and purity of its philosophy.'

Now let us hear what the reviewer in the foreign journal advances on this same fact of Weare's murder, and the phrenological circumstances connected with its perpetrator.

'Our adversaries,' he says, 'have brought this incident forward to overwhelm us under the many weights of phrenological, moral, and religious perverseness. Our doctrine has been reproached with finding in the head of the assassin Thurtell a large development of benevolence, and thus making him out to be a harmless, good-natured person, and not the atrocious, cool-blooded murderer, who could brood for days and nights over iniquity.'

'Surely the persons who make such an allegation as this must have been scared by their dread of phrenology out of all they ever knew of human nature, if they cannot perceive that the same man does at one moment an act of kindness and at another an act of cruelty; that he is at one moment just, at another unjust. What was Augustus persecuting and proscribing, and Augustus emperor? What was Nero a stripling, and Nero when he saw the city blazing? What is every man whom we have ever known? Is there not a true but common cant about the mingled nature of the human species; about the good and evil of our hearts, which shows the inordinate absurdity of such a remark, and might dispense us from all further answer? But let us examine facts, and see, not from his head but from his biography, what Thurtell was:

'Thurtell being applied to in behalf of a friend in distress, drew out from his pocket his last remaining half sovereign, and said 'give him the half of this; but no, he wants it more than I do, he is sick, give it him all.' He once incautiously caused a quarrel between two friends, and shed tears of tenderness over their reconciliation. His kindness to Hunt excited as much gratitude as Hunt was capable of feeling. His affection towards all his family was extreme, and his attachment to his friends inviolable; his general character when lieutenant on board the Adamant in the Leith roads, was that of a dashing, thoughtless, good-hearted officer. Yet from his early youth he was irascible, and what was called a murderous shot, a very dare-devil, a kind of prize-fighter, a notorious liar, a dupe of all his gambling associates; and he became a pre-determined cold-blooded murderer. These are facts; and let us now put different systems to the test by endeavouring to explain them:—Unity of mind, its indivisibility into various faculties, feelings, and propensities, can do it nearly as well as the indivisibility of the solar ray can explain the prismatic spectrum and the rainbow. This system needs not then much examination, and recourse must be had to some which admit a plurality of faculties. But which of these must be preferred? One that is hypothetical, or one which is founded in fact? All are subject to the same objection of admitting contradictory sentiments in man; and if phrenology falls by this objection all the rest must fall; and so indeed must facts. Whatever system does not admit a sentiment, or a combination of sentiments, to account for Thurtell's irascibility, his benevolence, his pugnacity, his attachment, his lying, his firmness, his tenderness, his cruelty, is defective. Let those who have leisure examine whether phrenology does not effect this more completely than all the others put together, and better than any that could be fabricated by this means. In truth no metaphysics but those of phrenology could account for the apparent contradictions in that man's mind; none which reject, as fundamental principles of human nature, benevolence, combativeness, attachment, destructiveness, secretiveness, firmness, can explain the facts of his life and character. If his charitable, generous acts be not totally denied, how would unity of mind reconcile them with the murder he committed? But the doctrine of the phrenologist says he had large benevolence, and this was sometimes very active; he had large combativeness, large destructiveness, and, when circumstances roused these into action, they were the more imperious because they were aided by a strong development of all the inferior propensities. The cerebral organisation of Thurtell, compared with his life, testifies as strongly in favor of phrenology as facts can do; and if the world had been told by any other tongue but that of our science that he, or any other murderer, had often done kind actions, the thing would have appeared quite simple, quite in conformity with daily observations. But the subterfuges which men take to evade conviction, when they are resolved that they will not be convinced, are wonderful.'

Such are the opposite accounts and opinions respecting the same fact or occurrence, as narrated by an enemy and a friend to the philosophy of cerebral organisation; and, if we extend our collection and contrast from one into many instances, we shall still find the same discrepancy of sentiment, the same variation of feeling, as to the strength of facts, in aid of the cause. Non nos componere lites. Let the reader again read and judge for himself.

'Viewing phrenology,' says Mr. Stone, 'simply as 'a science of facts,' it is quite obvious that the facts which indeed constitute its very existence should be numerous, striking, and unequivocal; they should not be 'few and far between,' with ever and anon a confusion and doubt as to their identity; they should form a strong and irresistible body of evidence, sufficient to stifle the objections of the most scrupulous of sceptics. The doctrines of phrenology having been for many years industriously promulgated, in 1828 six gentlemen of the modern Athens, who, professing themselves of the phrenological system of Drs. Gall and Spurzheim, resolved themselves into a society for the purpose of 'collecting facts and preserving views that might enlarge the boundaries of the science.' Let us therefore enquire what has been their success? After the example of other more ancient and learned bodies, they proposed publishing their transactions;—a work which, if there had been the slightest truth in phrenology, would have been undoubtedly very interesting and valuable. Not so, however: the 'Transactions of the Phrenological Society,' ushered into existence beneath the auspices of the most zealous and sanguine of its enthusiasts, arrived only at the conclusion of the first volume, which soon floated down the red sea of literature, to the trunkmaker's warehouse, unnoticed, unreviewed, unlamented! Whether it sunk into oblivion from the heaviness of its metaphysical disquisitions, or whether it was discontinued in consequence of the editors having been gravelled for lack of matter, may yet be a problem to the publisher; but, certain it is, this work, of upwards of 400 pages, contains only eight phrenological facts, which, by the date of the institution and its transactions, appear to have been *four* years in accumulating. Thus died, in the first years of its existence, the 'Transactions of the Phrenological Society;' and the proceedings of this learned association have since only been transmitted in 'shreds and patches' to the phrenological journal, within the sybilline leaves of which we find only a heterogenous mixture of the most incoherent intellectual wanderings, and the coarsest personal abuse. This work has been published quarterly for the last five years. It has lately been supported by the principal phrenologists, and, after all, contains only *twenty* reports of cranial measurements; so that notwithstanding the great outcry that has been raised of the many evidences in favor of phrenology—notwithstanding the zeal of its advocates and their united perseverance—they have in this country only been enabled to concentrate within the pages of their leading works *twenty-eight* facts in support of their thirty-five organs.' 'And even these,' our pamphleteer adds, 'being selected partially, and measured only by the phrenologists themselves, cannot be admitted as, strictly speaking, impartial evidence.'

Now let us have an extract from the phrenological champion we have so repeatedly quoted in reference to this question, of whether facts speak for or against the system?

'If the Edinburgh Review,' says the foreign quarterly reviewer, 'has not been able to prevent the public attention from being directed to phrenology, and convinced by truth, still less has it been able to arrest the accumulation of *facts*; and the fifteenth number of the Phrenological Journal (page 467) contains, what in a certain slang dialect would be called such a *plumper*, that nothing softer than the reviewer's fact-proof cranium could resist it: Mr. Deville's visit to the convict ship England, bound with 148 prisoners for New South Wales. This zealous practitioner, after examining the convicts, gave a memorandum of the inferred character of each individual, and of the manner in which the propensities of each were likely to manifest themselves. The most desperate were accurately pointed out, and one man in particular, Robert Hughes, was noted as most dangerous on account of his ferocity and dissimulation. A mutiny, at the head of which was Hughes, was on the point of breaking out, and the conduct of every prisoner coincided most accurately with Mr. Deville's predictions. The records of the whole transaction are now officially in the victualling office, and the following is extracted from a letter of Mr. Thomson, surgeon to the ship, to whose care the convicts were committed.

'I have to thank you for your introduction to Deville and phrenology. Deville is right in every case but one, Thomas Jones, but this man can neither read nor write; and, being a sailor, he was induced to join the conspiracy to rise and seize the ship and carry her to South America, being informed by Hughes that he would then get his liberty. Observe how Deville has hit the real character of Hughes, and I will be grateful to Deville all my life, for his report enabled me to shut up in close custody the malcontents, and arrive here not a head minus, which, without the report, it is more than probable I could not have done. All the authorities here are become phrenologists.'

'Now,' continues our reviewer, 'the man who does not admit that to be a science which only errs but once in 148 cases, must have little experience of what human science is.'

And thus stands the pro and con of fact, with the comments on either side, as far as our pages can afford space to follow them. The contradiction you constantly hear in the narration of private circumstances is also conspicuous. The writer not long since heard a violent enemy to the cranioscopical scheme—a man of celebrity in literature—state that Dr. Gall, in taking a gauge of his cranium, discovered the manifestation of almost the only two dispositions he was conscious of being entirely destitute of, namely, the love of order, and the love of music. We lately heard that an individual, whose propensities have been proverbially amative, was declared by Mr. Deville to be without the organ of amativeness; and, in turning over the pages of a Treawe must consider that some of these trials have been of rather too wanton a nature, and that torture and immolation have too frequently been resorted to for proving what is insusceptible of proof in this way, and, if proved, of little avail.

Cordially therefore do we join in the sentiments and statements contained in the following paragraph from our much admired, and so much quoted, reviewer, and with this extract do we at once take leave both of him and our readers.

'One claim at least is to be made in favor of our science, and this distinguishes it from all the branches of physiology which have been cultivated to this day; it has cost no blood: not a single act of cruelty has dishonored it. While Messrs. Magendie, Flourens, and others, have been torturing animals to teach their pupils but little, and repeating their tortures to learn that little over and over again, our masters have not mutilated a single insect while alive, or shortened the existence of a single being, to have its brains a few days sooner under their scalpel. Yet phrenologists might feel as much interest in scraping away a piece of cautiousness, and then observing how dauntless the animal would become; or of excavating an organ of locality, to make him lose his way, as any physiological butcher could do; or they might be as curious as Vesalius was, to take a peep into the living organs of some human subject. But they have abstained from every act of cruelty, and shown that anatomy and physiology may receive some of its best additions without becoming inhuman.'

PHREN'SY, *n. s.* } Fr. *phrenesie*; Gr.
PHRENET'IC, *adj.* & *n. s.* } φρενιτις. Madness; franticness: often written frenzy. See FRENZY. Phrenetic is mad; frantic: as a noun substantive a mad person.

Many never think on God, but in extremity of fear, and then, perplexity not suffering them to be idle, they think and do as it were in a *phrensy*. *Hooker.*

Demoniack *phrensy*, moping melancholy. *Milton.*

Would they only please themselves in the delusion, the *phrensy* were more innocent; but lunaticks will needs be kings. *Decay of Piety.*

I see so many kinds of *phrensies* in the world, and so many seemingly wise brains taken with them, that I much doubt whom I may be sure to account free, from either the touch, or at least the danger of this indisposition. *Bp. Hall.*

Phreneticks imagine they see that without, which their imagination is affected with within. *Harvey.*

What œstrum, what *phrenetic* mood,
Makes you thus lavish of your blood?
Hudibras.

The world was little better than a common fold of *phreniticks* and bedlams. *Woodward's Nat. Hist.*

Phrensy or inflammation of the brain, profuse hamorrhages from the nose resolve, and copious bleeding in the temporal arteries. *Arbuthnot on Aliments.*

PHRICIUM, an ancient town near Thermopylæ. Livy, xxxvi. c. 13.

PHRONIMA, the daughter of Elearchus king of Crete, wife of Polymnestus, and mother of Battus, the founder of Cyrene.

PHRYGANEA, a genus of insects having the following characters:—The mouth is without teeth, but furnished with four palpi: the stemmata are three in number; the antennæ are filiform, and longer than the thorax. The wings are incumbent; the under ones are folded. The genus has been divided into two sections; the first of which is characterised by having two truncated setæ at the extremity of the abdomen, resembling the beard of an ear of corn; while the second has the abdomen simple, or without appendices. The tarsi of the feet of the first family consist of three articulations; those of the second are composed of five. The wings of this section decline from the inner margin towards the sides, so as to resemble the ridge of a house, and are curved or turned upwards at their extremity. 'This insect,' says Barbut, 'before it becomes an inhabitant of the air, has lived under water, lodged in a kind of tube or sheath, the inward texture of which is silk; outwardly covered with sand, straws, bits of wood, shells, &c. When the hexapod worm is about to change to a chrysalis, he stops up the opening of his tube with threads of a loose texture, through which the water makes its way, but prevents the approach of voracious insects. The crysalis is covered with a thin gauze, through which the new form of the insect is easily discerned. The phryganea, on the point of changing its element, rises to the surface of the water, leaves its tube, rises into the air, and enjoys the sweets of the country, flutters upon flowers and trees, but is soon called away to the water-side to deposit its eggs: whence proceed its posterity. These aquatic larvæ are often found in stagnating waters, where they wrap themselves up in the water-lentil, cut out into regular squares, and fitted one to another. Trouts are very greedy of these larvæ, which is the reason that in some countries, after stripping them of their coats, they make use of them for fishing-baits.' There are various different species of the phryganea; but, except the phryganea bicauda and striata, they do not materially differ from one another, except in size and color.

1. P. bicauda is of a deep dark brown color, having a single yellow longitudinal band running across the head and thorax. The legs are of a brown color, as are the antennæ; which are also long and filiform. Two brown threads, almost as long as the antennæ, terminate the abdomen; whence the name bicauda, or two-tailed. The wings, which are about a third longer than the body, are veined with brown fibres, are narrow at the top, broad below, and are as it were stuck upon the body; which they infold, crossing one over the other. This insect, which is met with on the bank of rivers and standing waters, carries its eggs in a cluster at its abdomen, like some spiders.

2. P. striata is a large species, of a dun color except the eyes, which are black, and has a considerable resemblance to the phalæna in the carriage of its wings. The antennæ are as long as

the body, and are borne straight forward. The wings are a third larger than the body, having veins of a color rather deeper than the rest. The feet are large, long, and somewhat finny. Mr. Yeats tells us that the perlæ of Geoffroy, and phryganeæ of Linnæus, do not differ generically. It appears, however, from Yeats's experiments, that the phryganeæ remain longer in the chrysalis than the perlæ.

PHRYGANEÆ, THE LESSER, very much resemble the tineæ; but, upon examining them with a glass, the former will be found to be covered with small hairs instead of the scales which adorn the wings of the latter.

PHRYGES, a river in Asia Minor, dividing Phrygia from Caria, and falling into the Hermus. —Paus.

PHRYGIA, a country of Asia. Whence it derived its name is not certain; some say it was from the river Phryx (now Sarabat), which divides Phrygia from Caria, and falls into the Hermus; others from Phrygia, the daughter of Asopus and Europa. The Greek writers tell us that the country took its name from the inhabitants, and these from the town of Brygium in Macedonia, whence they first passed into Asia, and gave the name of Phrygia or Brygia to the country where they settled. Bochart is of opinion that this tract was called Phrygia from the Greek verb φρυγειν, to burn or parch; which, according to him, is a translation of its Hebrew name, derived from a verb of the same signification. No less various are the opinions of authors as to the exact boundaries of this country; an uncertainty which gave rise to an observation made by Strabo; viz. that the Phrygians and Mysians had distinct boundaries, but that it was scarcely possible to ascertain them. The same writer adds that the Trojans, Mysians, and Lydians, are, by the poets, all blended under the common name of Phrygians, which Claudian extends to the Psidians, Bithynians, and Ionians.

PHRYGIA MAJOR, and indeed all Asia Minor, as lying in the fifth and sixth northern climates, was, in ancient times, greatly celebrated for its fertility. It abounded in all sorts of grain; being for the most part a plain country covered with a deep rich soil, and plentifully watered by small rivers. It was in some parts productive of bitumen and other combustible substances. It was well stocked with cattle, having large plains and pasture grounds. The air was anciently deemed most pure and wholesome, though it is now in some parts thought extremely gross, great part of the country lying uncultivated. In Phrygia Major were anciently several cities of great celebrity, such as Apamea, Laodicea, Hierapolis, Gordium, &c. There were also some famous rivers, such as Marsyas, Mæander, &c., now called Madre or Mindre. See MÆANDER. The Phrygians accounted themselves the most ancient people in the world. Their origin, however, is extremely dark and uncertain. Josephus and St. Jerome say that they were descended from Togarmah, one of Gomer's sons; and that they were known to the Hebrews under the name of Tigrammanes. The heathen authors derive them from the Brygians, a people of Macedonia. But this is a conjecture totally unsupported, except by the similarity of names. Bochart thinks that the Phrygians were the offspring of Gomer, the eldest son of Japhet; the word Phrygia being the Greek translation of his name. Josephus makes Gomer the father of the Galatians; but he, by the Galatians, must necessarily mean the Phrygians inhabiting that part of Phrygia which the Galatians had made themselves masters of; the descendants of Gomer being placed by Ezekiel northward of Judea, near Togarmah (which Bochart takes to be Cappadocia) long before the Gauls passed over into Asia. The ancient Phrygians are described as superstitious, voluptuous, and effeminate, without any prudence or forecast, and of such a servile temper that nothing but stripes and ill-usage could make them comply with their duty; which gave rise to several trite and well known proverbs. They are said to have been the first inventors of divination by the singing, flying, and feeding of birds. Their music, commonly called the Phrygian mode, is alleged by some as an argument of their effeminacy. Their government was monarchical; and all Phrygia was, during the reigns of some kings, subject to one prince. Ninnacus, Midas, Manis, Gordius, and his descendants, were undoubtedly sovereigns of all Phrygia. But, some time before the Trojan war, this country was divided into several petty kingdoms, and we read of divers princes reigning at the same time. Apollodorus mentions a king of Phrygia contemporary with Ilus, king of Troy. Cedrenus and others speak of one Teuthras, king of a small country in Phrygia, whose territories were ravaged by Ajax, himself slain in single combat, his royal seat laid in ashes, and his daughter, Tecmessa, carried away captive by the conqueror. Homer mentions Phorcys and Ascanius, both princes and leaders of the Phrygian auxiliaries that came to the relief of Troy. Tantalus was king of Sipylus only, and its district: a prince no less famous for his great wealth than infamous for his covetousness and other detestable vices. That Phrygia was subdued either by Ninus, as Diodorus Siculus informs us, or by the Amazons, as we read in Suidas, is not sufficiently warranted. Most authors who mention Gordius tell us that the Phrygians, having sent to consult an oracle, to know how they might put an end to the intestine broils which rent their country into many factions and parties, received for answer that the most effectual means to deliver themselves and their country from the calamities they groaned under was to commit the government to a king. This advice they followed, and placed Gordius on the throne. As to their commerce, all we know is, that Apamea was the chief emporium of all Asia Minor. Thither resorted merchants and traders from all parts of Greece, Italy, and the neighbouring islands. Syncellus says that the Phrygians were for some time masters of the sea; and none but trading nations ever prevailed on that element. The country produced many choice and useful commodities, which afforded considerable exports. They had a safe coast, and convenient harbours. The Phrygian idols were very numerous. The chief of these was Cybele, who went by a variety of names. They also worshipped Bacchus under the name of Sabazios; and his priests they called Sabbi. The history of their kings is uncertain, and the dates of their several reigns and actions cannot now be fixed; we shall refer such of our readers, therefore, as wish to know what is certain respecting them to the Ancient Universal History, already quoted more than once in the present article. See also GORDIUS, MIDAS, &c.

PHRYGIA MINOR. See TROY.

PHRYGIA PROPER, according to Ptolemy, was bounded on the north by Pontus and Bithynia; on the west by Mysia, Troas, the Ægean Sea, Lydia, Mæonia, and Caria; on the south by Lycia; on the east by Pamphylia and Galatia. It lies between 37° and 41° N. lat., extending in long. from 57° to 62°. The inhabitants of this country, mentioned by Ptolemy, are the Lycaones and Anthemisenii, towards Lycia; and Moccadelis or Moccadine, the Cydesses or Cydisses towards Bithynia; and between these the Peltini or Speltini, the Moxiani, Phylacenses, and Hierapolitæ. To these we may add the Berecyntes mentioned by Strabo. Phrygia is commonly divided into the Greater and Lesser Phrygia, called also Troas. But this division did not take place till Troas was subdued by the Phrygians; and hence it is more considered by some Roman writers as a part of Phrygia than Bithynia, Cappadocia, or any other of the adjacent provinces. In after ages the Greater Phrygia was divided into two districts or governments, called, 1. Phrygia Pacatiana, from Pacatianus, who, under Constantine, bore the great office of the præfectus prætorio of the east; and 2. Phrygia Salutaris, from some miraculous cures supposed to have been performed there by the archangel Michael.

PHRYGIAN STONE, in natural history, is the name of a stone described by the ancients, and used by them in dyeing; perhaps from some vitriolic or aluminous salt contained in it, which served to enliven or fix the colors used by the dyers. It was light and spongy, resembling a pumice; and the whitest and lightest were reckoned the best. Pliny gives an account of the method of preparing it for the purpose of dyeing, which was by moistening it with urine, and then heating it red hot, and suffering it to cool. This calcination was repeated three times, and the stone was then fit for use. Dioscorides recommends it in medicine after burning; he says it was drying and astringent.

PHRYMA, in botany, a genus of the gymnospermia order, and didynamia class of plants; in the natural method, ranking in the sixtieth order, personatæ.

PHRYNE, a courtezan of Athens who flourished about A. A. C. 328. She was mistress of Praxiteles, who drew her picture, which was one of his best pieces, and was placed in the temple of Apollo at Delphi. Phryne became so very rich, by the liberality of her lovers, that she offered to rebuild Thebes at her own expense, which Alexander had destroyed, provided this inscription was placed on the walls, Alexander diruit, sed meretrix Phryne refecit; which was refused. See Plin. xxxiv. c. 8.

PHRINICUS. 1. A general of Samos, who endeavoured to betray his country: 2. A flatterer at Athens: 3. A tragic poet of Athens, disciple to Thespis. He was the first who introduced a female character on the stage.

PHRYNIS. 1. A musician of Mitylene. He was the first who obtained a musical prize at the Panathenæa at Athens. He added two strings to the lyre, which had always been used with seven by all his predecessors. He flourished about A. A. C. 438, and was originally a cook at the house of Hiero king of Sicily: 2. A writer in the reign of Commodus, who made a collection, in thirty-six books, of phrases and sentences from the best Greek authors, &c.

PHRYNO, a celebrated general of Athens, who flourished about A. A. C. 590.

PHRYXUS, in fabulous history, a son of Athamus, king of Thebes, by Nephele. When his mother was repudiated, he was persecuted with the most inveterate fury by his step-mother Ino, because he was to sit on the throne of Athamas, in preference to her children. His mother apprized him of Ino's intentions upon his life; or, according to others, his preceptor; and, the better to make his escape, he secured part of his father's treasures, and privately left Bœotia with his sister Helle, to go to their relation Æetes, king of Colchis. They embarked on board a ship, or, as we are informed by the poets and mythologists, they mounted on the back of a ram, whose fleece was of gold, and proceeded on their journey through the air. The height to which they were carried made Helle giddy, and she fell into the sea. Phryxus gave his sister a decent burial on the sea-shore, and after he had called the place Hellespont, from her name, he continued his flight, and arrived safely in the kingdom of Æetes, where he offered the ram on the altar of Mars. The king received him kindly, and gave him Chalciope his daughter in marriage. She had by him Phrontis, Melas, Argos, and Cylindrus, whom some call Cytorus. He was afterwards murdered by his father-in-law, who envied him the possession of the golden fleece; and Chalciope, to prevent her children from sharing their father's fate, sent them privately from Colchis to Bœotia, as Ino was then dead. The fable of the flight of Phryxus to Colchis on a ram has been explained by some, that the ship on which he embarked was either called by that name, or carried on her prow a figure of that animal. The fleece of gold is accounted for by observing, that Phryxus carried away immense treasures from Thebes. Phryxus was placed among the constellations of heaven after death. The ram which carried him to Asia is said to have been the fruit of Neptune's amour with Theophane the daughter of Atlas. This ram the gods had given to Athamas to reward his piety and religious life: and Nephele procured it for her children, just as they were going to be sacrificed to the jealousy of Ino. Phryxus's murder was some time after amply revenged by the Greeks; it having occasioned the famous expedition achieved under Jason and many of the princes of Greece, which had for its object the recovery of the golden fleece, and the punishment of the king of Colchis for his cruelty to the son of Athamas.

PHTHIA, an ancient town of Thessaly, in Phthiotis, east of Mount Othrys, famous for being the birth-place of Achilles, hence called Pthius heros.

PHTHIOTIS, in ancient geography, a province of Thessaly, between the Sinus Pelasgicus and Sinus Maliacus, Magnesia, and Mount Oeta; also called Achaia. Paus. x. c. 8.

PHTHIRIASIS (Gr. φθειρ, the louse), or morbus pediculosus, a disease in which several parts of the body generate lice, which often puncture the skin, and produce little sordid ulcers. There are two principal species of lice which infest the human body, i. e. the pediculus humanus, and the morpiones or crab lice. Respecting that variety of the former which we call body-lice Linnæus observes, 'varietas capitis durior, coloratior, vestimentorum laxior, magis cinerea.' They breed abundantly among the inhabitants of sordid dwellings, chiefly workhouses, gaols, &c., and in such situations prey upon persons of all ages. There is also a peculiar state of skin in people advanced in years, and connected with the disease, which has been denominated prurigo senilis by Dr. Willan, in which they are generated, and multiply rapidly notwithstanding every attention to cleanliness or regimen. The nits or eggs are deposited on the small hairs of the skin; and the pediculi are found on the skin or linen. Many marvellous stories are related by Forestus, Schenckius, and others, respecting lice bred under the skin, and discharged in swarms from abscesses, strumous ulcers, and vesications, and many individuals of great note are stated to have died in consequence in ancient times. Plutarch relates of Sylla: 'It was long before he perceived that he had an ulcer within his body; but at last the flesh putrefied, and produced such a quantity of lice, that, though many persons were employed day and night in destroying them, yet they increased much faster than they could be removed; and to such a degree did the distemper prevail, that his clothes, baths, basins, and food, were polluted with that perpetual flux of corruption and vermin. He went many times in the day into the water, to scour and cleanse his body, but all in vain; the vermin multiplied so fast as to baffle every attempt to destroy them.' Our biographer adds, 'it is said that, among the ancients, there died of this disease Acastus the son of Pelias, and nearer our own times Alcmæon the poet, Pherecydes the philosopher, Callisthenes the Olynthian, during the time of his imprisonment, and Mutius the lawyer: and, if it be proper to add to these a person not distinguished by any merit or virtue, Eunus, a fugitive slave, who was author of the war in Sicily, called the 'servile war,' and who was taken and carried prisoner to Rome, died likwise of this sickness.' Herod, Ennius, and by some Plato is said also to have been destroyed by lice. In more recent times, Amatus Lusitanus states that he was witness to the case of a gentleman, who perished in this way; 'so universally did these insects swarm over his body, that two negro servants were entirely employed in collecting baskets full from his person, and carrying them to the sea.'

It appears probable that in the ancient accounts cases of ulceration which afforded a nidus for the breeding of maggots or flies have been mistaken for instances of the morbus pedicularis. In warm climates, flies are so numerous about the persons of the sick, that the utmost care is requisite to prevent the generation of larvæ from the eggs which they deposit, not only in superficial wounds, but in the nostrils, mouth, gums, and even in the brain. Even the black beetle (senebrio molipor) has been known to breed in the body in this way. But the generation of lice, in connexion with the prurigo of elderly people, is frequently a very troublesome malady in modern times; and the destruction of them is commonly a mere alleviation; since their reproduction is so very rapid. A decoction of the seeds of stavesacre, or of the cocculus indicus, or the powder of either of these substances, alone or mixed with lard in the form of an ointment, are effectual destroyers of the pediculi of the head, and even of the body-lice, as are the mercurial ointments, such as that of the white precipitated oxide. The morpiones, or crab-lice, which fix themselves firmly in the skin, about the pubes, axillæ, and in fact on every part of the trunk and extremities where there is hair, are completely destroyed either by inunction with the common blue mercurial ointment, or spike-oil, i. e. the essential oil of lavender mixed with oil of turpentine. A solution of the corrosive muriate of mercury in spirit is also often efficacious in the pedicular prurigo of the body, and tends to remove the pruriginous affection, which seems to give rise to the tendency to generate lice. But none of these pungent substances can be applied, except when the skin is unbroken.

PHTHI'SIC, *n. s.*, PHTHISICAL, *adj.*, PHTHISIS, *n. s.* } Fr. *phthisie*; Gr. φθισις. Consumption. This is the sense of both nouns: phthisical is wasting; pining.

A collection of purulent matter in the capacity of the breast, if not suddenly cured, doth undoubtedly impel the patient into a *phthisical* consumption.
Harvey on Consumptions.

His disease was a *phthisick* or asthma, oft incurring to an orthopnea. *Id.*

If the lungs be wounded deep, though they escape the first nine days, yet they terminate in a *phthisis* or fistula. *Wiseman.*

We next inquire, but softly and by stealth,
Like conservators of the public health,
Of epidemic throats, if such there are,
And coughs, and rheums, and *phthisic*, and catarrh.
Cowper.

PHTHISIS is a species of consumption, occasioned by an ulcer in the lungs. See MEDICINE, Index. Dr. Beddoes suggested a new theory of phthisis, founded on the pneumatic doctrine. He fixed on the effect of pregnancy in suspending the progress of phthisis as a fact which, by its mode of operation, might suggest a method of diminishing the havoc occasioned by this distemper. 'The fœtus, says he, has its blood oxygenated by the blood of the mother through the placenta. During pregnancy there seems to be no provision for the reception of an unusual quantity of oxygen. On the contrary, in consequence of the impeded action of the diaphragm, less and less should be continually taken in by the lungs. If, therefore, a somewhat diminished proportion of oxygen be the effect of pregnancy, may not this be the way in which it arrests the progress of phthisis? and, if so, is there not an excess of oxygen in the system of consumptive persons? and may we not, by pursuing this idea, discover a cure for this fatal disorder?' Dr. Beddoes thinks that this supposition is also countenanced by the deficiency of oxygen in the blood of asthmatic patients, and of those who labor under sea-scurvy; and by the super-abundance of it in the blood of phthisical persons, indicated by its color, by the aggravation of the symptoms of consumption by breathing oxygen, and by the relief from inspiring atmospheric air mixed with carbonic acid gas; and, lastly, from the small proportion of deaths among sea-faring people. From these facts Dr. Beddoes concludes, that '1. The phthisical inflammation may so alter the structure of the lungs as to cause them to transmit a more than ordinary portion of oxygen to the blood; or, 2. Some unknown cause having enabled them to transmit, or the blood itself to attract, more oxygen, an inflammation of the lungs might ensue.' Our author, in a letter to Dr. Darwin, gives an account of his treating with success several cases of phthisis according to the principles of this theory.

Dr. Hooper thus enumerates the species of this important disorder:—

1. Phthisis incipiens, incipient without an expectoration of pus.

2. Phthisis humida, with an expectoration of pus.

3. Phthisis scrophulosa, from scrofulous tubercles in the lungs, &c.

4. Phthisis hæmoptoica, from hæmoptysis.

5. Phthisis exanthematica, from exanthemata.

6. Phthisis chlorotica, from chlorosis.

7. Phthisis syphilitica, from a venereal ulcer in the lungs.

The causes which predispose to this disease, says this last writer, are very numerous. The following are, however, the most general: hereditary disposition; particular formation of body, obvious by a long neck, prominent shoulders, and narrow chest; scrofulous diathesis, indicated by a fine clear skin, fair hair, delicate rosy complexion, large veins, thick upper lip, a weak voice, and great sensibility; certain diseases, such as syphilis, scrofula, the small-pox, and measles; particular employments exposing artificers to dust, such as needle-pointers, stone-cutters, millers, &c., or to the fumes of metals or minerals under a confined and unwholesome air; violent passions, exertions, or affections of the mind, as grief, disappointment, anxiety, or close application to study, without using proper exercise; frequent and excessive debaucheries, late watching, and drinking freely of strong liquors: great evacuations, as diarrhœa, diabetes; excessive venery; fluor albus; immoderate discharge of the menstrual flux, and the continuing to suckle too long under a debilitated state; and, lastly, the application of cold, either by too sudden a change of apparel, keeping on wet clothes, lying in damp beds, or exposing the body too suddenly to cold air, when heated by exercise; in short, by any thing that gives a considerable check to the perspiration. The more immediate or occasional causes of phthisis are, hæmoptysis, pneumonic inflammation proceeding to suppuration, catarrh, asthma, and tubercles, the last of which is by far the most general.

'The incipient symptoms usually vary with the cause of the disease; but, when it arises from tubercles, it is usually thus marked: it begins with a short dry cough, that at length becomes habitual, but from which nothing is spit up for some time, except a frothy mucus that seems to proceed from the fauces. The breathing is at the same time somewhat impeded, and upon the least bodily motion is much hurried: a sense of straitness, with oppression at the chest, is experienced: the body becomes gradually leaner, and great languor, with indolence, dejection of spirits, and loss of appetite, prevail. In this state the patient frequently continues a considerable length of time, during which he is, however, more readily affected than usual by slight colds, and upon one or other of these occasions the cough becomes more troublesome and severe, particularly by night, and it is at length attended with an expectoration, which towards morning is more free and copious. By degrees the matter which is expectorated becomes more viscid and opaque, and now assumes a greenish color and purulent appearance, being on many occasions streaked with blood. In some cases, a more severe degree of hæmoptysis attends, and the patient spits up a considerable quantity of florid, frothy blood. The breathing at length becomes more difficult, and the emaciation and weakness go on increasing. With these, the person begins to be sensible of pain in some part of the thorax, which, however, is usually felt at first under the sternum, particularly on coughing. At a more advanced period of the disease a pain is sometimes felt on one side, and at times prevails in so high a degree as to prevent the person from lying easily on that side; but it more frequently happens that it is felt only on making a full inspiration, or coughing. Even where no pain is felt, it often happens that those who labor under phthisis cannot lie easily on one or other of their sides, without a fit of coughing being excited, or the difficulty of breathing being much increased. At the commencement of the disease, the pulse is often natural, or perhaps is soft, small, and a little quicker than usual; but, when the symptoms which have been enumerated have subsisted for any length of time, it then becomes full, hard, and frequent. At the same time the face flushes, particularly after eating, the palms of the hands and soles of the feet are affected with burning heat; the respiration is difficult and laborious; evening exacerbations become obvious, and, by degrees, the fever assumes the hectic form. This species of fever is evidently of the remittent kind, and has exacerbations twice every day. The first occurs usually about noon, and a slight remission ensues about five in the afternoon. This last is, however, soon succeeded by another exacerbation, which increases gradually until after midnight; but about two o'clock in the morning a remission takes place, and this becomes more apparent as the morning advances. During the exacerbations the patient is very sensible to any coolness of the air, and often complains of a sense of cold when his skin is, at the same time, preternaturally warm. Of these exacerbations, that of the evening is by far the most considerable. From the first appearance of the hectic symptoms, the urine is high colored, and deposites a copious branny red sediment. The appetite, however, is not greatly impaired, the tongue appears clean, the mouth is usually moist, and the thirst is inconsiderable. As the disease advances, the fauces put on rather an inflamed appearance, and are beset with aphthæ, and the red vessels of the tunica adnata become of a pearly white. During the exacerbations, a florid circumscribed redness appears on each cheek; but at other times the face is pale, and the countenance somewhat dejected. At the commencement of hectic fever, the belly is usually costive; but, in the more advanced stages of it, a diarrhœa often comes on, and this continues to recur frequently during the remainder of the disease; colliquative sweats likewise break out, and these alternate with each other, and induce vast debility. In the last stage of the disease the emaciation is so great that the patient has the appearance of a walking skeleton; his countenance is altered, his cheeks are prominent, his eyes look hollow and languid, his hair falls off, his nails are of a livid color, and much incurvated, and his feet are affected with œdematous swellings. To the end of the disease the senses remain entire, and the mind is confident and full of hope. It is, indeed, a happy circumstance attendant on phthisis, that those who labor under it are seldom apprehensive or aware of any danger; and it is no uncommon occurrence to meet with persons laboring under its most advanced stage, flattering themselves with a speedy recovery, and forming distant projects under that vain hope. Some days before death the extremities become cold. In some cases a delirium precedes that event, and continues until life is extinguished.

'As an expectoration of mucus from the lungs may possibly be mistaken for purulent matter, and may thereby give us reason to suspect that the patient labors under a confirmed phthisis, it may not be amiss to point out a sure criterion, by which we shall always be able to distinguish the one from the other. The medical world are indebted to the late Mr. Charles Darwin for the discovery, who has directed the experiment to be made in the following mannr:—Let the expectorated matter be dissolved in vitriolic acid, and in caustic lixivium, and add pure water to both solutions. If there is a fair precipitation in each, it is a certain sign of the presence of pus; but, if there is not a precipitate in either, it is certainly mucus.'

Sir Everard Home, in his dissertation on the properties of pus, states a curious, but not decisive mode of distinguishing accurately between pus and animal mucus. The property, he observes, which characterises pus, and distinguishes it from most other substances, is, its being composed of globules, which are visible when viewed through a microscope; whereas animal mucus, and all chemical combinations of animal substances, appear in the microscope to be made up of flakes. This property was first noticed by the late Mr. John Hunter. See MEDICINE, Index.

PHUL, or PUL, king of Assyria, is by some historians said to be Ninus under another name, and the first founder of that monarchy: a renowned warrior. He invaded Israel in the reign of Menahem, who became tributary to him, and paid him 1000 talents of silver for a peace. A. A. C. 771.

PHUT, or PHUTH, the third son of Ham. Gen. x. 6. Calmet is of opinion that Phut peopled either the canton of Phtemphu, Phtemphuti, or Phtembuti, set down in Pliny and Ptolemy, whose capital was Tharia in Lower Egypt, inclining towards Libya; or the canton called Phtenotes, of which Buthus was the capital. The prophets often speak of Phut. In the time of Jeremiah, Phut was under the obedience of Necho, king of Egypt. Nahum (iii. 9) reckons up his people in the number of those who ought to have come to the assistance of No-ammon, or Diospolis. See NUMIDIA.

PHYCUS (untis.) a promontory near Cyrene, now called Ras el Sem.—*Lucan*. ix.

PHYLACTERY, *n. s.* Fr. *phylactere*; Gr. φυλακτηριον. An ancient bandage on which was inscribed some memorable sentence.

Lest, when they had been abroad, they should have been touched by any, contrary to the warning of their *phylacteries*, they scoured themselves at their return. *Bp. Hall.*

The *philacteries* on their wrists and foreheads were looked on as spells, which would yield them impunity for their disobedience. *Hammond.*

Golden sayings,
On large *phylacteries* expressive writ,
Were to the foreheads of the Rabbins tied.
Prior.

PHYLACTERY, in general, was a name given by the ancients to all kinds of charms, spells, or characters, which they wore about them, as amulets, to preserve them from dangers or diseases.

PHYLACTERY also denoted a slip of parchment, whereon was written some text of Holy Scripture, particularly of the decalogue, which the devout people among the Jews wore on the forehead, the breast, or the neck, as a mark of their religion. The primitive Christians also gave the name phylacteries to the cases wherein they enclosed the relics of their dead. Phylacteries are often mentioned in the New Testament, and appear to have been very common among the Pharisees in our Lord's time.

PHYLACUS, the son of Deion, king of Phocis, and founder of Phylace in Thessaly. He married Clymene, the daughter of Mynias, by whom he had Iphiclus, the father of Protesilaus.

PHYLARCHUS, an ancient Grecian biographer, who flourished A. A. C. 220.

PHYLAS, an ancient town of Thessaly, built by Phylacus. Protesilaus reigned in it, hence called Phylacides. Lucan. vi. 252.

PHYLE, a well fortified village of Attica, near Athens. Cor. Nep.

PHYLICA, bastard alaternus; a genus of the monogynia order, and pentandria class of plants:

in the natural method ranking under the forty-third order, dumosæ. There are six species, of which three are kept in the gardens of this country; but, by reason of their being natives of warm climates, they require to be kept in pots, and housed in winter. They are all shrubby plants, rising from three to five feet high, and adorned with beautiful clusters of white flowers. They are propagated by cuttings.

PHYLLACHNE, in botany, a genus of the monandria order, and monœcia class of plants.

PHYLLALIA, 1. A district of Arcadia; 2. A town of Thessaly.

PHYLLANTHUS, in botany, sea-side laurel; a genus of the triandria order, and monœcia class of plants: in the natural method ranking in the thirty-eighth order, tricoccæ. There are six species, all natives of warm climates; and rise from twelve to fourteen feet to the height of middling trees. They are tender and cannot be propagated in this country without artificial heat.

PHYLLEIUS, a mountain and country of Macedonia. Apol. Arg.

PHYLLIS, in fabulous history, a daughter of Sithon, or, according to others, of Lycurgus, king of Thrace, who received Demophoon, the son of Theseus, who, at his return from the Trojan war, had stopped on her coasts. She became enamoured of him, and did not find him insensible to her passion. After some months of mutual tenderness and affection, Demophoon set sail for Athens, where his domestic affairs recalled him. He promised faithfully to return within a month; but either his dislike for Phyllis, or the irreparable situation of his affairs, obliged him to violate his engagement: and the queen, grown desperate on account of his absence, hanged herself, or, according to others, threw herself down a precipice into the sea and perished. Her friends raised a tomb over her body, where there grew up certain trees, whose leaves, at a particular season of the year, suddenly became wet, as if shedding tears for the death of Phyllis. According to an old tradition mentioned by Servius, Virgil's commentator, Phyllis was changed by the gods into an almond-tree, called phylla by the Greeks. Some days after this metamorphosis, Demophoon revisited Thrace; and, when he heard of the fate of Phyllis, he ran and clasped the tree, which, though at that time stripped of its leaves, suddenly shot forth, and blossomed, as if still sensible of tenderness and love. The absence of Demophoon from the house of Phyllis has given rise to a beautiful epistle of Ovid, supposed to have been written by the Thracian queen about the fourth month after her lover's departure.

PHYLLIS, in botany, bastard hare's-ear, a genus of the digynia order, and pentandria class of plants: in the natural method ranking under the forty-seventh order, stellatæ.

PHYLLIS, in geography, a country of Thrace, near Mount Pangæus.

PHYSALIS, the winter cherry, a genus of the monogynia order, and pentandria class of plants; in the natural method ranking under the twenty-eighth order, luridæ. There are sixteen species, of which the most remarkable is the

P. alkekengi, or common winter cherry. This grows naturally in Spain and Italy. The roots are perennial, and creep in the ground to a great distance if they are not confined. These, in the spring, shoot up many stalks, which rise to the height of a foot or more, garnished with leaves of various sorts, some of which are angular and obtuse, some oblong and sharp-pointed, with long foot-stalks. The flowers are produced from the wings, standing upon slender foot-stalks; are of a white color, and have but one petal. They are succeeded by round berries about the size of small cherries, enclosed in an inflated bladder, which turns red in autumn, when the top opens and discloses the red berry, which is soft, pulpy, and filled with flat kidney-shaped seeds. Soon after the fruit is ripe, the stalks decay to the root. The plant is easily propagated, either by seeds, or parting the roots.

PHYSALITE, or PYROPHYSALITE, in mineralogy, a sub-species of prismatic topaz. Color greenish-white. Massive. In granular concretions. Splendent in the cleavage, which is perfect, and as in topaz. Fracture uneven. Translucent on the edges. As hard as topaz. Specific gravity 3·451. It whitens with the blow-pipe. Its constituents are, alumina 57·74, silica 34·36, fluoric acid 7·77. It is found in granite at Finbo, in Sweden. Jameson.

PHYSALUS. See SCOLOPENDRA.

PHYSION, a cape or rock of Bœotia, famous for being the residence of the Sphynx.

PHYSCON, φυσκον, i. e. big-bellied. A nickname of a tyrant of Egypt. See EGYPT.

PHYSCONIA, Gr. φυσκων, a big-bellied fellow. Hyposarca; hypersarchidios. Enlargement of the abdomen. A genus of disease in the class cachexiæ, and order intumescentiæ, of Cullen; known by a tumor occupying chiefly one part of the abdomen, increasing slowly, and neither sonorous nor fluctuating. Species:—1. Hepatica; 2. Splenica; 3. Renalis; 4. Uterina; 5. Ab ovario; 6. Mesenterica; 7. Omentalis; 8. Visceralis.

PHYSCOS, a town of Caria, opposite Rhodes. Strabo, 14.

PHYSCUS, a river of Asia, running into the Tigris. Xenophon crossed it with his 10,000 Greeks, in their famous retreat from Cunaxa.

PHYSETER, the spermaceti fish, in zoology, a genus of mammalia, belonging to the order of cete. There are four species, according to Mr. Kerr:—

1. P. catodon, the round headed cachalot, with a fistula in the snout, and having no back fin. Of this species 102 of different sizes were cast ashore at one time on one of the Orkney Isles, the largest twenty-four feet in length. The head is round, the opening of the mouth small. Sibbald says it has no spout-hole, but only nostrils: but Mr. Pennant is of opinion that the former, being placed at the extremity of the nose, has been mistaken by him for the latter. Some teeth of this species are an inch and a quarter long, and in the largest part of the thickness of one's thumb. The top is quite flat, and marked with concentric lines; the bottom is more slender than the top, and pierced with a small orifice: instead of a back fin, there was a rough space. For the method of extracting the spermaceti from the brain of these creatures, see SPERMACETI.

2. P. macrocephalus, the blunt-nosed cachalot, the blunt-headed cachalot of Pennant, or spermaceti whale of Dudley, has no fin on the back; and the blowing-pipe is situated on the nape of the neck. Of this species Mr. Kerr enumerates three varieties, viz.:—

i. P. macr. albicans, the white blunt-nosed cachalot, of a white color with a smooth back. This is about fifteen or sixteen feet long, and resembles the common whale.

ii. P. macr. cinereus, the gray blunt-nosed cachalot; of a blackish ash color, with a hump on the back. This variety grows to sixty and even seventy feet long, by thirty or forty in circumference; has a very large head, with very small eyes; the lower jaw is much narrower than the upper, and is furnished with a considerable number of teeth, which are received into sockets of the upper jaw when the mouth is shut. It has a hump on the back, about a foot above the general surface. It is found in Davis's Straits.

iii. P. macr. niger, is black colored, and has a hump on the back twelve inches high. This variety is found in the European seas; it grows to about sixty feet long, and thirty-six in circumference: the head is exceedingly thick, and the lower jaw, which is smaller than the upper, has forty-six teeth in two rows, which rise two inches and a half above the gums, and are received into sockets in the upper jaw. The female teats are retractile. The substance improperly named spermaceti is procured from this species; and the spermaceti, or white oil, is extracted from it. It is found in the South coasts of Brasil, Patagonia, and the Pacific Ocean. Dr. Schwediaur says that ambergris is ejected from this animal. It feeds on the sepia octopodia.

3. P. microps, the black-headed cachalot, with a long fin on the back, and the upper jaw considerably longer than the under one. A fish of this kind was cast ashore on Cramond Isle, near Edinburgh, December 22d, 1769; its length was fifty-four feet; the greatest circumference, which was just beyond the eyes, thirty; the upper jaw was fifteen feet; the lower ten. The head was of a most enormous size, very thick, and above one-third the size of the fish: the end of the upper jaw was quite blunt, and nearly nine feet high; the spout-hole was placed near the end of it. The teeth were placed in the lower jaw, twenty-three on each side, all pointing outwards; in the upper jaw, opposite to them, were an equal number of cavities, in which the ends of the teeth lodged when the mouth was closed. One of the teeth measured eight inches long, the greatest circumference the same. It was hollow withinside for the depth of three inches, and the mouth of the cavity very wide: it was thickest at the bottom, and very small at the point, bending very much; but in some the flexure is more than in others. These, as well as the teeth of all other whales, are very hard, and cut like ivory. The eyes are very small, and remote from the nose. The pectoral fins were placed near the corners of the mouth, and were only three feet long; it had no other fin, only a large protuberance on the middle of the back. The tail was a little forked, and fourteen feet from tip to tip. The penis seven feet and a half long. Linnæus informs us that this species pursues and terrifies the porpoises to such a degree as often to drive them on shore.

4. P. tursio, the high-finned cachalot, has a very long fin on the back, and the ends of the teeth are flat. It inhabits the Northern Ocean, and grows sometimes to 100 feet long; the back fin is very long, sharp-pointed, and erect, like a ship's mast, and the blowing-pipe is placed flat on the forehead: the teeth are slightly bent and have their ends flattened.

PHYS'IC, *n. s.* & *v. a.*
PHYS'ICAL, *adj.*
PHYS'ICALLY, *adv.*
PHYSIC'IAN, *n. s.*
Gr. φυσικη. Natural philosophy; particularly and more commonly the science of healing or curing diseases; remedies; medicines: to physic is to treat with medicine; and, sometimes, to cure: physical means relating to nature; helpful to health; natural as distinct from moral; medicinal: the adverb following these senses: a physician is one who professes the healing or medical art; one who prescribes medicines.

Use *physick* or ever thou be sick. *Ecclus.* xviii. 19.

In itself we desire health, *physick* only for health's sake. *Hooker.*

The labour we delight in *physicks* pain. *Shakspeare.*

It is a gallant child; one that indeed *physicks* the subject, makes old hearts fresh. *Id.*

Is Brutus sick, and is it *physical*
To walk unbraced, and suck up the humours
Of the dank morning? *Id. Julius Cæsar.*

Trust not the *physician*,
His antidotes are poison, and he slays
More than you rob. *Id. Timon of Athens.*

Some *physicians* are so conformable to the humour of the patient, as they press not the true cure of the disease; and others are so regular, as they respect not sufficiently the condition of the patient. *Bacon's Essays.*

Prayer is the best *physic* for many melancholy diseases. *Peacham.*

His gratulatory verse to king Henry is not more witty than the epigram upon the name of Nicolaus, an ignorant *physician*, who had been the death of thousands. *Id. of Poetry.*

The people use *physick* to purge themselves of humours. *Abbot.*

It is worth observing how nature hath taught all living creatures to be their own *physicians*; the same power that gave them a being hath led them to the means of their own preservation. *Bp. Hall.*

The *physical* notion of necessity, that without which the work cannot possibly be done; it cannot be affirmed of all the articles of the creed, that they are thus necessary. *Hammond.*

To poore people the good *physician* prescribes cheap but wholesome medicines; not removing the consumption out of their bodies into their purses. *Fuller.*

I call that *physical* certainty which doth depend upon the evidence of sense, which is the first and highest kind of evidence of which human nature is capable. *Wilkins.*

Time, measuring out their motion, informs us of the periods and terms of their duration, rather than effecteth or *physically* produceth the same. *Browne.*

The outward act of worship may be considered *physically* and abstractedly from any law, and so it depends upon the nature of the intention, and morally, as good or evil: and so it receives its denomination from the law. *Stillingfleet*

He 'scapes the best, who nature to repair
Draws *physick* from the fields in draughts of vital air.
Dryden.

In virtue and in health we love to be instructed, as well as *physicked*, with pleasure. *L'Estrange.*

Were it my business to understand *physick*, would not the safer way be to consult nature herself in the history of diseases and their cures, than espouse the principles of the dogmatists, methodists, or chymists? *Locke.*

I do not say, that the nature of light consists in small round globules, for I am not now treating *physically* of light or colors. *Id.*

As all seasons are not proper for *physick*, so all times are not fit for purging the body politick. *Davenant.*

Though the act of the will commanding, and the act of any other faculty executing that which is so commanded, be *physically* and in the precise nature of things distinct, yet morally as they proceed from one entire, free, moral agent, may pass for one and the same action. *South's Sermons.*

Taught by thy art divine, the sage *physician*
Eludes the urn; and chains, or exiles death.
Prior.

Charity, in its origin, is a *physical* and necessary consequence of the principle of re-union. *Cheyne.*

He that lives *physically*, must live miserably. *Id.*

To reflect on those innumerable secrets of nature and *physical* philosophy, which Homer wrought in his allegories, what a new scene of wonder may this afford us! *Pope.*

Physic, or Physick, the art of healing, properly called medicine. The word is formed from the Gr. φυσις, nature; either because medicine consists principally in the observation of nature, or that the most important natural observations first took this direction. See Medicine, Physic, and Physics.

Physical, something belonging to, or really existing in nature. In this sense we say a physical point in opposition to a mathematical one, which only exists in the imagination; a physical substance or body, in opposition to spirit, or metaphysical substance, &c.

Physician of the Fleet, in the royal navy, is a person appointed by the Admiralty with the medical superintendence of a fleet or squadron of ships employed on any particular station, as the Channel, Mediterranean, West Indies, &c., and is under the immediate orders of the commander-in-chief: if an hospital ship is with the fleet, his residence is generally on board her; if not, it is usual for him to be in the flag-ship with the commander-in-chief.

The arrangement of every thing appropriated to the reception of the sick, sent on board the hospital ship for cure, shall be under his direction; and the surgeon, and all other persons appointed to attend them. He is to propose to the commander-in-chief every thing which he may think likely to be of service to the sick, to increase their comforts, or to accelerate their cure. He is also to visit the different ships of a squadron frequently; to enquire into the health of the ships' companies, and the treatment of the sick; and, if any unusual sickness prevails on board, he is to represent the same to the commander-in-chief, with the nature of the disease, and the necessary means which he deems requisite for eradicating and putting a stop to the progress of the malady. He is also authorised to examine the journals of the medical officers, to enquire into the practice of the surgeon of any ship he visits, and his manner of treating the diseases of the men under his care, and to give him such directions as he may deem necessary. He is also to enquire into the conduct and abilities of the assistant-surgeons, that he may be able to point out to the sick and hurt board, or to the commander-in-chief, those who may he best qualified for any particular service, or for promotion. And, whenever he shall think it necessary, he is to examine the instruments, medicines, and necessaries, on board any ship.

Physician of a Naval Hospital, is a person appointed by the admiralty to one of his majesty's naval hospitals, to superintend and prescribe medicine for the inward complaints of the sick and wounded seamen; and to attend such physical patients every day, or as often as circumstances may require.

Physicians. According to an ancient statute no person within London, or seven miles thereof, shall practise as a physician or surgeon, without license from the bishop of London, or dean of St. Paul's; who are to call to their assistance four doctors of physic, on examination of the persons, before granted: and in the country, without license from the bishop of the diocese, on pain of forfeiting £5 a month. Stat. 3 Hen. VIII. c. 11. By the charter for incorporating the College of Physicians, they have power to choose a president, and have a perpetual succession, a common seal, ability to purchase lands, &c. Eight of the chiefs of the college are to be called elects, who from among themselves shall choose a president yearly: and if any practise physic in the said city, or within seven miles of it, without license of the college under their seal, he shall forfeit £5. Also persons practising physic in other parts of England are to have letters testimonial from the president and three elects, unless they be graduate physicians of Oxford or Cambridge, &c. Stat. 14 and 15 Hen. VIII. c. 5, confirmed and enlarged by stat. 1 Mary, stat. 2, c. 9. 32 Hen. VIII. c. 40, ordains that four physicians, called censors, shall be yearly chosen by the college, to search apothecaries' wares, and have an oath given them for that purpose by the president; apothecaries denying them entrance into their houses, &c., incur a forfeiture of £5. And physicians refusing to make the search are liable to a penalty of 40s. And every member of the College of Physicians is authorised to pracise surgery.

Physicians, Colleges of. See College.

PHYSICO-Mathematics, a science which includes those branches of physic, which, uniting observation and experiment to mathematical calculation, undertake to explain the phenomena of nature.

Physico-Theology, from physic and theology. Divinity enforced or illustrated by natural philosophy.

PHYSICS.

Physics, Lat. *physica*, of Gr. φυσις nature, is a term that has been used as synonymous both with Physiology, which see, and natural philosophy. It has, therefore, been made to embrace the entire doctrine of the bodies and existences of the universe; their phenomena, causes, and effects.

Mr. Locke would include God, angels, and spirits, under this term; but these are more usually referred to metaphysics. The more immediate and proper objects of physics are said to be body, space, and motion.

The origin of physics, thus considered, is referred, by the Greeks, to the barbarians, viz. the brachmans, magi, and the Hebrew and Egyptian priests.

From these it was derived to the Greek sages or sophi, particularly to Thales, who is said to have first professed the study of nature in Greece. Hence it descended into the Pythagoric, Platonic, and Peripatetic schools; whence it was propagated into Italy, and thence through the rest of Europe: though it is clear that the Druids, Bards, &c., had a system of physics of their own.

PART I.

History of Physical Systems.

Treatises upon this subject have usually embraced, therefore, an account of the ancient systems of the universe, replete as they are with exploded errors. We know no writer who has placed the folly of this spirit of system, the idola tribus, specus, fori et theatri of lord Bacon in a more lively manner before his readers than the abbé le Pluche.

Though we commonly, he says, give the appellation of systems to the different suppositions by which Ptolemy, Copernicus, and Tycho Brahe, have endeavoured to account for the course of the heavens, it is not what we now mean by general and systematical physics. We are now supposed to be considering a philosophy which undertakes to explain the profound construction of the whole universe. The project is noble: various celebrated philosophers have employed themselves in it; they have made numerous parties, and many disputes. The history of their pretensions may either determine us in the choice of the best side, or in remaining entirely neuter.

Epicurus, reviving the ideas of Leucippus and Democritus, thought he very well comprehended that particles of matter different in form, having subsisted from all eternity, had, after a certain time, linked themselves to one another in the vacuum; that some proceeding in straight lines, and others in curved, fell into different clusters, and formed bodies and spirits; that the free agency of man was, above all, the work of atoms which moved in a declining line; thus chance made the sun, peopled the earth, established the order which subsists in it; and framed, out of one and the same paste, the world, and the intelligent being which is the spectator of it; that we are not to imagine the sun was made to light us, or our eyes to see; but we having perceived that the sun might serve to light us, and that our eyes might serve to see with, we made use both of the sun and our eyes to that purpose.

Aristotle, and his partisans, believed the world was composed of a first matter, which, they say, had no form, but is capable of all forms; out of which the four elements issued, composing all bodies, and into which they are all resolved, or return in their last analysis. There is, indeed, some difference between this first matter and the atoms; but Epicurus and Aristotle agree in this, that they admit, at setting out, a first fund of indeterminate matter, capable of entering into all sorts of conditions and compositions.

Gassendi resumes these atoms and this vacuum of Epicurus for the construction of his world, with this difference, that he put them all into the hands of God, to give them motion according to the wise designs of his Providence.

Descartes rejects the vacuum, and will have every thing in his world full; though we can hardly reconcile the liberty of motion with a thorough exactness of plenitude. It is thus that he conceives of the creation of the world:—God, in the first place, formed an immense mass of homogeneous matter; all the different parts of which were cubical, or at least angular. He afterwards impressed on these particles a double motion. He makes the greater part of them turn on their centre, and several clusters among them round their common centre, which he names vortices. This being done, according to him, all is done; and by the friction of the angles of these parcels, from thence was formed a very fine dust, which he calls the first element or subtile matter; next a globulous matter, which he calls the second element or light; and lastly, a massive dust striped and branched, which he names the third element, from which he formed all sorts of massive bodies. This chaos, coming out of the hand of God, disposed itself in order, according to Descartes, by virtue of the two motions impressed upon it by God, and of itself became a world like ours; 'in the which, though that God placed no order or proportion,' these are his own terms 'one may see all things, as well general as particular, which appears in the real world.'

The alchymists, to be in a condition to make gold, and to prepare a restorative which immortalizes, or at least greatly prolongs life, were obliged to search to the profound of nature, and found they imagined, that salt, sulphur, and mercury, with some other ingredients, respecting which they could not agree upon among themselves, were certainly the immediate elements of metals, and all bodies; but yet there was really a first matter susceptible of all sorts of forms, as all the sages of Egypt and Greece, and all the philosophers of all ages averred; wherefore they had nothing to do but to work upon this first matter, to mould it different ways, and to give it a certain turn, to be possessed of gold, jewels, and the vivifying elixir.

Hitherto, then, we see a perfect agreement among all these sects of philosophers upon the principal point. They all, though under different terms, go back to a chaos of the first matter, and numberless particles which are neither gold, silver, salt, bud, fruit, or any thing determinate: but which will serve for a composition of all things, by their mixtures; and into which all things may at last be resolved. The only difference we find between them in this point is, that the alchymists have more wit than the others, and make a better use of wisdom. The Aristotelians and the Corpusculists are always ready to enter into the lists about a plenum and vacuum, matter and form, the principles of bodies, and the last term of their dissolutions, and all this to no purpose. They are all battling among themselves about the best method of disposing of matter, as if the world was now to be made or governed. But, alas, it is already made, and goes on in its course without them! According to Aristotle, Epicurus, Gassendi, and Descartes, gold and sand are originally the same matter. Descartes, by breaking his cubes, saw sun, gold, and light itself, arise. Let us put the sand into motion by force of fire and friction, break its angles, deprive it of that accidental form which makes it sand, and by a proper manuduction transmute it into gold. What riches! what felicity and assistance to human society! should we once arrive to this point.

The alchemists, therefore, labored far more to the purpose apparently. If the systematical philosophers think rightly on the article of a first matter, in which they all agree, the latter think still better in reducing these speculations to practice, and attempting to change this matter so as to produce gold and immortality. But here, unluckily for the honor of this sort of philosophy, alchemists die; and not only so, but they sooner than others. The greater number of them are parched among their furnaces and pestiferous exhalations; and this is certain, they all ruin themselves. Their fruitless attempts prove the falsity of the principle which they had from the philosophers, and dispense with our entering into a tedious examination of this imaginary philosophy.

As it is but loss of time for us to stir the atoms of Gassendi, or to whirl about the angular bodies of Descartes, continues our lively abbé, we shall possibly find the attractive, centripetal, and centrifugal philosophers of the north turn to better account.

The difference between M. Descartes and Sir Isaac Newton is, that the former undertakes to account for every thing; and the other, modestly acknowledging that we are ignorant of the secrets of nature, pretends only to evince one matter of fact (see our article PHILOSOPHY) without undertaking to explain the cause; but as this one point extends, according to him, to all nature, his system for that reason becomes a kind of universal philosophy. According to M. Descartes, that gravity which causes bodies to fall is nothing different from the action of the fluids in which the planets are carried away; because all bodies moved and impelled by the bodies surrounding them, to describe a circular instead of a straight line, incessantly endeavour to recede from the centre; whence it happens that when the parts of the vortex meet with the bodies which have no centrifugal force, or which have less, they are compelled to fly to the centre; so that the precipitation of heavy bodies towards the centre is nothing but the action of more active bodies which have a tendency to avoid it.

Sir Isaac Newton at first thinks with M. Descartes, from whom he had learned it, that all bodies continue in a state of inaction, or repose, till drawn out of it or interrupted. But again, Sir Isaac Newton imagines that he has observed throughout all nature, and it is the distinguishing point of his system, that all bodies attract one another in proportion to their distance and bulk; that they have a certain tendency towards, and press upon another; that the sun tends towards the earth, and the earth towards the sun; but that, the latter being incomparably larger, we perceive only the approaches of the former towards it: that in like manner the earth tends towards the stone which is separated from it by projection, as the stone tends towards the earth, or rather that, the stone attracts the earth to it, as the earth attracts the stone; but the earth, by reason of its bulk, having a stronger attraction than a small stone, it happens from thence that the earth does not quit its place, and that the stone approaches or is drawn to it by the attractive power which the earth exercises upon it.

This action, which Newton imagines he every where perceives between bodies and bodies, throughout all nature, he calls attraction, and gives it out as an effect residing in every part of the universe, without being able to assign other cause than the will of God to put all nature in motion. Thus, the earth moving round the sun, if it was only moved, and not drawn towards it, would infinitely recede from it. The moon, if it obeyed without obstacle the law of motion which carries it away, would avoid the earth, and at length disappear. In the same manner, if the earth obeyed only the law of attraction, that law by which the sun draws the earth to it, it would draw near to, and precipitate into the sun; the moon, being only attracted, would fall upon the earth: but the earth being moved and cast off from the sun, is at the same time drawn toward it; instead of receding from it in a straight line, this line will be curved by the attraction which brings it back to the sun: being always under the influence of two powers, one of which always removes it from the sun, and the other draws it back, it describes round the sun a curved line, which Newton demonstrates ought to be an ellipsis, or near to an oval. The moon, in like manner, obeying two powers, one which makes it fly from, the other which makes it tend towards the earth, revolves round it; the centrifugal and the centripetal forces are checks one upon the other; and the moon, instead of being carried far from us by the first power, or precipitated upon our earth by virtue of the second, is, by the impression of both, kept within its orbit.

'Sir Isaac Newton afterwards examines what would be the measures of motion of the moon beginning to fall towards the earth, from the height of its orbit, after it had lost its centrifugal force, and was freed from all attraction of the earth. The distance of the moon from the earth is known, also the duration of its revolution; one may then know what is the portion of the orbit in a minute. Geometry teaches us what space the moon runs through in a right line falling towards the earth, by virtue of the force which makes it pass through its arch, or portion of its orbit. Afterwards, having laid it down that the attraction diminishes as the square of the distance increases, Newton finds by his calculations that the moon, in falling from its station, would at first fall fifteen feet in a minute; and that near the earth, by virtue of the same law, it would in a minute pass through 3600 times fifteen feet. Lastly, examining the spaces which a body of wood or stone let fall would pass through near the earth, he concludes, from the experience gained by the fall of bodies, that a stone runs in one minute, near our globe, through 3600 times fifteen feet. The moon, being loosed from its orbit, would therefore obey the same law which precipitates the stone. By a necessary consequence, if the stone was carried as high as the orbit of the moon, being there let fall, it would run through fifteen feet in a minute. Attraction and gravity are then one and the same thing.

'M. Privat de Molieres, of the Academy of Sciences, has retained, in his Philosophical Lectures, the ground-work of Newton's observations. He admits all the proofs which show that] the same cause which makes a stone gravitate upon the earth makes the earth gravitate upon the sun and the moon upon the earth; but he attributes this effect to a cause very different from that which Newton has imagined. The French academician, at the same time that he extols the exactness of the geometrical system of the learned Englishman, finds it incompatible with the plan of nature. He is not reconciled to a principle which makes of our world, one *All*, whose parts are as naked, and less united than those of a skeleton. All the ideas which we have of mechanics seem to him to be overthrown by this imaginary attraction, which, according to the partisans of the English geometrician, reciprocally acts between bodies separated by a great vacuum, and makes them move in a void, without uniting by any intermediate bond. M. Molieres resumes the vortex of M. Descartes; the existence of which seems to him to be almost palpably nature. He corrects it in the whole; and, making all the effects which Newton had observed to flow from the very structure of the vortex, he in some measure reconciles the two contending schools. This vortex is no longer composed, as Descartes has imagined, of hard inflexible globules, but of small vortices, the particles of which are incessantly inclining to recede from their peculiar centre, while the whole tends to remove from the common centre. A solid body, as the moon or earth, cast into this vortex, ought immediately to be moved by it, and carried the same way with it; but the parts of this unwieldy body being strictly united, and at rest among themselves, make no effort for motion, and have no other impulsion than what the whole body of the planet receives from the vortex in which it floats; whereas the globules of the vortex have a double motion, and make a double effort; all of them tend to remove from the common centre, the moment they are forced, by the surrounding vortices, to move in a circular line. Moreover, all the particles of these globules perform that in little, round their centre, which the great ones do in general round their common centre. From this double tendency results a double force, which more powerfully removes them from the centre than the motion impressed on the planet removes it from the centre of the sphere. The planet cast into this vortex has indeed received a centrifugal force, in receiving a circular motion; but, its parts being at rest, it has less centrifugal force than the vortex, in which this force is double, as well from the motion of the little vortices which fly from the common centre, as their particles, which all at the same time avoid their respective centres. Thus the centrifugal force in the matter of the vortex, exceeding the centrifugal force of the planet, ought to prevail: and, the planet tending less to recede from the centre than the matter which pushed it on, it must follow, that the earth will by degrees draw nearer to the sun, and the moon fall upon the earth. In a word, De Molieres makes use but of one action, or same cause, to produce the centrifugal force of the vortex, and to make the planets, and all solid bodies, gravitate to one and the same centre: instead of which Newton adds a motion impressed on all these bodies; another power and another law, which he names *attraction*, and which disposes them all to draw near to one another, with more or less velocity, in proportion to their solidity, or their distances; while, indeed, the second power is useless and inconceivable.

'M. de Molieres, after having given us this assistance, by his ingenious explanation of gravity, to comprehend the double centrifugal force of vortices, and the advance of solid bodies towards the centre, as a simple effect of this force, left us at first in doubt of the power he would make use of to sustain the planets in their orbit, and to prevent their falling upon the centre. But it was easy to perceive, at the same time, that he would be compelled to make use of different vortices, at least of different atmospheres, cast round the planets, to make them roll over one another, without falling, like the globules of different matter, which, crowding together, flatten a little by their pressure upon each other; while, in the interim, the centres which tend one towards another, by the impulsion of the encompassing vortices, can never approximate. This explanation of M. de Molieres is so much the more ingenious as it is not made use of for the creation of a world, but to give an idea of its motion and support, as it may be employed in the particular explanation of a number of phenomena, and of particular cases; such, for example, as the flux and reflux of the sea, by the pressure of the sphere of the moon on that of the earth; the shifting of the satellites of Jupiter, by the pressure of the sphere of Saturn on that of Jupiter; the attractions and repulsions of electric bodies, by the small atmospheres which they acquire or lose, according to the different manner they are touched; the dissolutions and fermentations in chemistry, by the different powers of the little vortices which compose liquids, and which can only appear at rest when they are put in equilibrio, after a long agitation, occasioned by inequality of efforts.

'I shall not here touch upon the systems which M. Huygens, Bulfinger, Bernouilli, and many others have imagined respecting gravity; it is but a point of the mechanics of the universe. Should we ask fifty philosophers an explanation of them, there is not one of them but would believe that he gave you a philosophy that was to be esteemed in proportion to the geometry and calculations he had employed in it. Even all these indefatigable calculations will often, setting out with the same principles, lead you to as many different sums, different mechanisms, and to as many systems, as there are different persons whom you consult. What will be the consequence, when, from this point, we go on to an explanation of the bolsters of the axis, and the profound structure of the other parts of the universe. Entering into these systematical opinions will be quitting a view of nature, and losing sight of the certain use which we may make of it, and in which consists our true philosophy. Another reason to keep us upon our guard with relation to systems is, that, however beautiful they may appear at first sight, the application we may make of them to different effects generally turns out unlucky and ridiculous. Make use, for example, of the system of attraction, for the phenomenon of the loadstone, where one would think it ought to be of great use; or for electricity; or for what is called fermentation; you will find that your principle will leave you in the lurch, and will inform you in nothing; they are obliged to vary their attractions like their effects. Here, it is an attraction which acts through the whole depth of the mass: there, it is an attraction which only acts on the slightest superficies of the body, let them be thin or thick; there, a certain attraction is the same, while another attraction varies, as do the diversities of the bodies.

'I shall here end the history of systematical philosophy, because it is of little use to give a more full knowledge of it, and perhaps may be dangerous to young people, by busying their minds upon systems, which cannot fail, in spite of all our exertions, to present some phenomena to our thoughts, which is a very great prejudice to the progress of true philosophy; either because it is not easy to get rid of certain generalities, or that we see every thing conformable to our prejudices. *Experimental philosophy* is the only one which has been of use to human society; and, as we have shown that the advantages flowing from it are innumerable, so we cannot recommend for the study of philosophy a more prudent method than that which the members of the Royal Academy have followed for our instruction. They have never, as a collective body, given their approbation to any one general system. They are fully persuaded that, if man be allowed to arrive at a thorough knowledge of nature, it can be only by treasuring up experiments and facts for a great length of years; and, should even this thorough knowledge be denied to our condition, experiments at least, and the knowledge of most minute things, will procure, as is daily experienced, various benefits to public society. This very judicious principle, which they have always looked upon as a rule, and the nature of the different functions which these learned men have divided among themselves, are accurately founded on the necessaries of life, and the extent of our capacities. They go farther: the experimental philosophy which they have brought into esteem is the only useful one, because it is the only one conformable to our condition: which, without offence, we may name, The System of Providence.

'The experience of 6000 years is certainly sufficient to teach us what is possible and what is forbidden. While man, in his enquiries, was busied in things submitted to his government, his endeavours were always rewarded by new discoveries. Whenever he would pry into the interior structure of the parts of the universe, the motion of which is not submitted to his care, his ideas have been fantastical and uncertain. Let him study the measures of magnitudes, and the laws of motions; not to pace out the heavens, or to weigh the solid bodies of the planets, but to know the order of his days; let him observe the relation of the aspects of the heavens to his habitation, the progression of light in the modification in which it is presented to him; the use he may make of the equilibrium of liquids, of the weights and velocities of the bodies of which he is master, of all the experiments which come within his view, and especially under his hand; in a word, let him apply experiments to the necessaries of life, and he will have an unerring philosophy, replete with great advantages. But to undertake to determine the cause which governs the motion of the universe, and to penetrate into the universal structure, and the particular parts of which it is composed, is to forfeit the honor of improving his patrimony in order to run after shadows. It is neglecting treasures which are open to us, and obstinately persisting to knock at a door which has been shut against us these 6000 years.

'It is no conjectural opinion, but a visible truth of experience, that God has given us great facility and intelligence in things which we ought to manage; and, on the contrary, that those to which God himself gives motion and action, without entrusting the conduct to our care, he has concealed from our knowledge. For example, we are ignorant of the structure of our stomach, because God has eased us of the care of its digestion. In vain would the most able anatomist direct his digestion; all very often goes contrary to his wishes. On the other hand, we have in our senses many watchful and faithful monitors, opportunely to direct what nourishment is proper for us. Why then have we so many methods to be acquainted with our nutriment, if it is not that the care of seeking and choosing it is committed to us? And why, on the contrary, do we not know how to digest, if it be not that God has evidently willed our digestion to be performed in us without our direction? God, who has spared us that trouble, has denied us the knowledge of the mechanism which forms the flesh and the fruits that we eat, as well as the mechanism which extracts the juices from them for our nourishment. This knowledge would have distracted us. We attain the age of four-score and ten, without knowing what digestion is, or what is the action of the muscles. We have been served without any care on our part. Had we thoroughly known the structure of our stomach, we should have been for directing its functions. God has not allowed this knowledge to man. He ordained him to be otherwise employed. If then this mechanism be hid from him, lest it should multiply his cares, will he acquaint him with the structure of the world, the motion of which is not committed to his charge?

'The common sailor knows nothing more of the loadstone than what his senses inform him, viz. its tendency towards the North Pole. This is the sum of his knowledge. The philosopher would know the cause of this phenomenon; he employs the effluvia of its pores in spiral lines, the attractions, the repulsions; and after using his mechanics, his geometries, and calculations for several years, he either acknowledges that he himself knows nothing of the matter, or else has the mortification to find that nobody approves of his system. The systematical philosopher, who thinks himself ignorant if he know not the cause of what he sees, passes his whole life in the pursuit of possibilities, and becomes useless to the rest of mankind by being buried alive in his closet. The sailor makes use of what his senses inform him of, the direction of the loadstone towards the North, and by its assistance voyages to the end of the world. Make choice of ten thousand other informations of fact, and you will hardly find one of them but what is of service. Our fortunes will be better in proportion to this sort of knowledge. Would you seek after the causes of these effects? You will meet with nothing of certainty or use. Can we, after this, mistake the intention of God, in the measure of understanding which he affords us for our present instruction?—It is evident that we have no universal knowledge. The objects of our pursuit are scattered round us upon the earth and in the heavens. God has given us, together with eyes and understanding, a fund of curiosity which stimulates us from one object to another, that new experiments may enable us to procure new conveniencies for our brethren; and that every thing upon earth may, by degrees, be put to the best use for the profit of mankind. But, though a man can go on a stretch from Brest to Pekin, it does not follow that he can go to the moon; or though he have a principle of power in his hands that enables him to support piles of oak, and great blocks of marble in the air, this affords no reason why he should attempt with his levers to make the moon fly off from her orbit, or to fix his pulleys to the body of Jupiter, to rob him of one of his satellites. As man's strength is limited, so likewise is his knowledge, and these bounds are suited to his wants. He meets with opposition every where, when he enters upon idle speculations. But he proceeds from discovery to discovery, which discoveries work miracles, when he employs himself in making the best use of that which is about him. Our reason is always attended with success in uniting the truths of experience with the necessities of life, in making a prudent use of the benevolence of the Creator, and in giving him the glory. This is the sum total of human knowledge.'

We have inserted the above, not because we either go along with the writer in some of his objections to endeavouring after a complete knowledge of the universe, or because we approve with him M. de Moliere's qualified doctrine of the vortices: but because it contains a fair view of many theories of physics, and some excellent practical remarks on the general subject of forming them.

Let us hear the more discriminating but equally humbling account of professor Playfair, respecting the ancient physics:—'A resemblance between the events with which the observer was most familiar and those to which he was less accustomed, and which had excited his wonder, was the first object of enquiry, and produced the first advances towards generalisation and philosophy. This principle, which it were easy to trace from tribes the most rude and barbarous to nations the most highly refined, was what yielded the first attempts towards classification and arrangement, and enabled man, out of individuals subject to perpetual change, to form certain fixed and permanent objects of knowledge—the species, genera, orders, and classes, into which he has distributed these individuals. By this effort of mental abstraction he has created to himself a new and intellectual world, free from those changes and vicissitudes to which all material things are destined.

'Another great branch of knowledge is occupied, not about the mere arrangement and classification of objects, but about events or changes, the laws which those changes observe, and the causes by which they are produced. In a science which treated of events and of changes, the nature and properties of motion came of course to be studied, and the ancient philosophers naturally enough began their enquiries with the definition of motion, or the determination of that in which it consists. Aristotle's definition is highly characteristical of the vagueness and obscurity of his physical speculations. He calls motion 'the act of a being in power, as far as in power,'—words to which it is impossible that any distinct idea can ever have been annexed. The truth is however, that the best definition of motion can be of very little service in physics. Epicurus defined it to be the 'change of place,' which is no doubt the simplest and best definition that can be given; but it must, at the same time, be confessed that neither he, nor the moderns who have retained his definition, have derived the least advantage from it in their subsequent researches. The properties, or, as they are called, the laws of motion, cannot be derived from mere definition; they must be sought for in experience and observation, and are not to be found without a diligent comparison and scrupulous examination of facts. Of such an examination neither Aristotle nor any other of the ancients ever conceived the necessity, and hence those laws remained quite unknown throughout all antiquity.

'Instead of conceiving that there resides in body a natural and universal tendency to persevere in the same state, whether of rest or of motion, they believed that terrestrial bodies tended naturally either to fall to the ground or to ascend from it, till they attained their own place; but that, if they were impelled by an oblique force, then their motion became unnatural or violent, and tended continually to decay. With the heavenly bodies, again, the natural motion was circular and uniform, eternal in its course, but perpetually varying in its direction. Thus, by the distinction between natural and violent motion among the bodies of the earth, and the distinction between what we may call the laws of motion in terrestrial and celestial bodies, the ancients threw into all their reasonings upon this fundamental subject a confusion and perplexity from which their philosophy never was delivered.

'There was, however, one part of physical knowledge in which their endeavours were attended with much better success, and in which they made important discoveries. This was in the branch of *mechanics* which treats of the action of forces *in equilibrio*, and producing not motion but rest;—a subject which may be understood, though the laws of motion are unknown. The first writer on this subject is Archimedes. He treated of the lever, and of the centre of gravity, and has shown that there will be an equilibrium between two heavy bodies connected by an inflexible rod or lever, when the point in which the lever is supported is so placed between the bodies that their distances from it are inversely as their weights. Great ingenuity is displayed in this demonstration; and it is remarkable that the author borrows no principle from experiment, but establishes his conclusion entirely by reasoning à priori. He assumes, indeed, that equal bodies, at the ends of the equal arms of a lever, will balance one another; and also that a cylinder, or parallelopiped, of homogeneous matter, will be balanced about its centre of magnitude. These, however, are not inferences from experience; they are, properly speaking, conclusions deduced from the principle of the sufficient reason. The same great geometer gave a beginning to the science of *hydrostatics*, and discovered the law which determines the loss of weight sustained by a body on being immersed in water or in any other fluid. His demonstration rests on a principle which he lays down as a postulatum, that, in water, the parts which are less pressed are always ready to yield in any direction to those that are more pressed, and from this, by the application of mathematical reasoning, the whole theory of floating bodies is derived. The above is the same principle on which the modern writers on hydrostatics proceed; they give it not as a postulatum, but as constituting the definition of a fluid. Archimedes, therefore, is the person who first made the application of mathematics to natural philosophy.

'The mechanical enquiries, begun by the geometer of Syracuse, were extended by Ctesibius and Hero; by Anthemius of Tralles; and, lastly, by Pappus Alexandrinus. Ctesibius and Hero were the first who analysed mechanical engines, reducing them all to combinations of five simple mechanical contrivances, to which they gave the name of δυναμεις, or powers, the same which they retain at the present moment. Even in mechanics, however, the success of these investigations was limited; and failed in those cases where the resolution of forces is necessary, that principle being then entirely unknown. Hence the force necessary to sustain a body on an inclined plane is incorrectly determined by Pappus, and serves to mark a point to which the mechanical theories of antiquity did not extend.

'In another department of physical knowledge, *astronomy*, the endeavours of the ancients were also accompanied with success. I do not here speak of their astronomical theories, which were indeed very defective, but of their discovery of the apparent motions of the heavenly bodies, from the observations begun by Hipparchus and continued by Ptolemy. In this their success was great; and while the earth was supposed to be at rest, and while the instruments of observation had but a very limited degree of accuracy, a nearer approach to the truth was probably not within the power of human ingenuity. Mathematical reasoning was very skilfully applied, and no men whatever, in the same circumstances, are likely to have performed more than the ancient astronomers. They succeeded, because they were observers, and examined carefully the motions of which they treated. The philosophers, again, who studied the motion of terrestrial bodies, either did not observe at all, or observed so slightly that they could obtain no accurate knowledge, and in general they knew just enough of the facts to be misled by them.'

'Though, on account of this inattention to experiment,' says our philosopher afterwards, 'nothing like the true system of natural philosophy was known to the ancients, there are nevertheless to be found in their writings many brilliant conceptions, several fortunate conjectures, and gleams of the light which was afterwards to be so generally diffused. Anaxagoras and Empedocles, for example, taught that the moon shines by light borrowed from the sun, and were led to that opinion, not only from the phases of the moon, but from its light being weak and unaccompanied by heat. That it was a habitable body, like the earth, appears to be a doctrine as old as Orpheus; some lines, ascribed to that poet, representing the moon as an earth, with mountains and cities on its surface. Democritus supposed the spots on the face of the moon to arise from the inequalities of the surface, and from the shadows of the more elevated parts projected on the plains. Every one knows how conformable this is to the discoveries made by the telescope. Plutarch considers the velocity of the moon's motion as the cause which prevents that body from falling to the earth, just as the motion of a stone in a sling prevents it from falling to the ground. The comparison is in a certain degree just, and clearly implies the notion of centrifugal force; and gravity may also be considered as pointed at for the cause which gives the moon a tendency to the earth. Here, therefore, a foundation was laid for the true philosophy of the celestial motions; but it was laid without effect. It was merely the conjecture of an ingenious mind, wandering through the regions of possibility, guided by no evidence, and having no principle which could give stability to its opinions. Democritus, and the authors of that physical system which Lucretius has so beautifully illustrated, were still more fortunate in some of their conjectures. They taught that the Milky Way is the light of a great number of small stars, very close to one another; a magnificent conception, which the latest improvements of the telescope have fully verified. Yet, as if to convince us that they derived this knowledge from no pure or certain source, the same philosophers maintained that the sun and the moon are bodies no larger than they appear to us to be. Very just notions concerning *comets* were also entertained by some of the ancients.

'It was, however, often the fate of such truths to give way to error. The comets, which these ancient philosophers had ranked so justly with the stars, were degraded by Aristotle into meteors floating in the earth's atmosphere; and this was the opinion concerning them which ultimately prevailed. But, notwithstanding the above, and a few other splendid conceptions which shine through the obscurity of the ancient physics, the system, taken on the whole, was full of error and inconsistency. Truth and falsehood met almost on terms of equality; the former separated from its root, experience, found no preference above the latter; to the latter, in fact, it was generally forced to give way, and the dominion of error was finally established.

'One ought to listen, therefore, with caution to the encomiums sometimes bestowed on the philosophy of those early ages. If these encomiums respected only the talents, the genius, the taste, of the great masters of antiquity, we would subscribe to them without any apprehension of going beyond the truth. But if they extend to the methods of philosophising, and the discoveries actually made, we must be excused for entering our dissent, and exchanging the language of panegyric for that of apology. The infancy of science could not be the time when its attainments were the highest; and, before we suffer ourselves to be guided by the veneration of antiquity, we ought to consider in what real antiquity consists. With regard to the progress of knowledge and improvement, 'we are more ancient than those who went before us.' The human race has now more experience than in the generations that are past, and of course may be expected to have made higher attainments in science and philosophy. Compared with natural philosophy, as it now exists, the ancient physics are rude and imperfect. The speculations contained in them are vague and unsatisfactory, and of little value, but as they elucidate the history of the errors and illusions to which the human mind is subject. Science was not merely stationary, but often retrograde; the earliest opinions were frequently the best; and the reasonings of Democritus and Anaxagoras were in many instances more solid than those of Plato and Aristotle. Extreme credulity disgraced the speculations of men who, however ingenious, were little acquainted with the laws of nature, and unprovided with the great criterion by which the evidence of testimony can alone be examined. Though observations were sometimes made, experiments were never instituted; and philosophers, who were little attentive to the facts which spontaneously offered, did not seek to increase their number by artificial combinations. Experience, in those ages, was a light which darted a few tremulous and uncertain rays on some small portions of the field of science, but men had not acquired the power over that light which now enables them to concentrate its beams, and to fix them steadily on whatever object they wish to examine. This power is what distinguishes the modern physics, and is the cause why later philosophers, without being more ingenious than their predecessors, have been infinitely more successful in the study of nature.'

PART II.

The Claims of Modern Physical Science

After all, there is a *general connexion* between the various parts of the universe, and a general *division* of its objects. All things on this globe are connected with each other by the laws of motion and of mind. Our globe is connected with the whole of the solar system: Sir Isaac Newton has clearly proved, by gravitation. If we extend our observations to the fixed stars, the connexion by no means fails. Their inconceivable distance, indeed, renders it impossible for us to acquire any extensive knowledge of their nature. But they are evidently connected with the solar system by the identity of the light which they emit with that emitted by our sun, by their periodical motions, &c.

In this great and unbounded scene of contemplation, our attention is naturally directed to the different classes of objects in proportion to the interest we take in them. There is nothing in which we are so much interested as our fellow-men; and therefore we study their distinctive nature by attending to their characteristic appearances. But we extend this inference to a great number of beings besides our fellow-men, namely, to the whole animal creation; for in all we observe the same subserviency to the ends of the agent, in the changes which we find them continually producing in the objects around them. These changes are all adjusted to their own well-being. In all such cases, therefore, we are forced, by the constitution of our own minds, to infer the existence of design or intention in these beings also.

But, in numberless changes produced by external objects on each other, we observe no such fitness in the effects, no such subserviency to the well-being of the agent. In such cases, therefore, we make no such inference of thought or design.

Thus, then, there is presented to our observation an important distinction, by which we arrange all external objects into two classes. The first resembles ourselves, in giving external marks of that thought or intention of which we are conscious; and we suppose in them the other properties which we discover in ourselves, viz. thought, perception, memory, foresight, and all that collection of faculties which we feel in ourselves, and which constitute the animal. The other class of objects exhibit no such appearances, and we make no such inference. Thus we divide the whole objects of external nature into the classes of *thinking* and *unthinking* beings.

Our first judgments about these classes, however, must be very inaccurate. But, when an animal dies, we observe that it no longer gives the former marks of thought and intention, and that it now resembles the class of unthinking beings, although it still retains all that fitness of organical structure which it had before. This leads us to conclude that the distinction does not arise from a difference in organical structure, but from a distinct substance common to all thinking beings, but separable from their organical frame. To this substance we ascribe thought, intention, contrivance, and all that collection of faculties which we feel in ourselves. To this substance, in ourselves, we refer all sensations, pleasures, pains, remembrances, desires, purposes; and to this aggregate, however imperfectly understood, we give the name of mind. Our organical frame, which seems to be only the instrument of information and operation to the mind, we call our body. But, as the animating principle is not like our body the immediate object of the senses, we naturally conceive it to be a substance essentially different from those which are the objects of our senses. The most savage nations have shown a disposition to form this conclusion. Observing that animal life was connected with breathing, it was natural to imagine that breathing was living, and that breath was life. It is a remarkable fact that in most languages the term for breath is one of the terms for the soul: רוח, πνευμα, spiritus, in the Hebrew, Greek, and Latin, express both; gheist or ghost, in the Teutonic, comes from gheisen, to breathe or sigh; dūcha or dūba, the soul, in Sclavonic, comes from duichat, to breathe; and so in many other languages.

Very little refinement, however, is necessary to convince us that air or breath cannot be the substance which thinks, wishes, and designs; and that the properties of this substance, whatever it is, must be totally different from, and incompatible with, any thing that we know among the immediate objects of our senses. Hence we are led to conclude that there are two kinds of substances in nature: one which is the principle of sensation, and therefore cannot be the object of our senses, more than light can be the object of the microscope. This substance only can feel, think, desire, and propose, and is the object of reflection alone. The objects of our senses compose the other class, and therefore can have none of the other properties, which are not cognoscible by the senses. These have all the properties which our senses can discover: and we can have no evidence of their having any other, nor indeed any conception of their having them. This class is not confined to the unorganised masses of matter; for we see that the bodies of animals lose after death that organical form, and are assimilated to all the rest of unthinking beings.

From such views as these, while all nations have agreed to call this class of objects by the name body, which originally expresses our organical frame, some nations, farther advanced in cultivation or refinement, have contrived an abstract term, to express this general substance of which all inanimate beings are composed. Such terms we have in the words materia, υλη, matter, &c.

Matter is that substance which is immediately and obviously cognoscible by our senses. Whatever is not thus cognoscible by our senses is immaterial; hence mind is said to be immaterial. It is of importance to keep in mind this distinction, which is more than merely grammatical. Little more is necessary for detecting the sophism of Helvetius, Mirabeau, and other sages of the Gallic school, who had endeavoured to remove the ties of moral and religious obligation by lowering our conceptions of our intellectual nature. It also shows how hastily they have formed their opinions who have ascribed to the immediate agency of mind all those relations which are observed in the actions of bodies on each other at a distance. The characteristic phenomenon, or distinguishing quality, of mind is *invention*. The phenomenon by which this quality is suggested to us is *art*, or the employment of means to gain ends; and the mark of art is the supposed conduciveness of these ends to the well being of the agent. Where this train is not evident, design or intention is never thought of. We have, and can have, no motion of mind different from those of our own minds, and we discover the existence of other minds as we discover the existence of bodies, by means of phenomena, which are characteristics of minds, and which resemble those phenomena that follow the exertion of our own mental faculties, by the employment of means to attain desired ends; and, where such appearances are not observed, no existence of a mind is inferred. When we see a man fall from the top of a house, and dash out his brains on the pavement, we never ascribe this motion to his mind. Although the fitness of many of the celestial motions for most important purposes makes us suppose design and contrivance somewhere, and therefore a Supreme Mind, we no more think of inferring a mind in the earth, from the fitness of its motions for purposes most beneficial to its inhabitants, than of inferring a mind in a bit of bread from its fitness for nourishing our bodies.

The term mind, therefore, in the ordinary language of all men, is applied to what desires and wills, at the same time that it perceives and understands. If we call that mind which produces motion, we must derive our notions of its qualities or attributes from observing their effects. We must, therefore, discover the general laws by which agents act, that is, the general laws observed in those motions which we consider as their effects. Now these are the general laws of motion; and in none of these can we find the least coincidence with what we are accustomed to call the laws of mind. Nay, it has been the total want of similarity which has given rise to the distinction which all men, in all ages and countries, have made between mind and matter. This distinction is found in all languages; and it is an unpardonable liberty which men take with languages when they use a term of distinction, a specific term, to express things of a different species. What some modern authors have been pleased to call mind, the whole world besides have called by another name, force; which, though borrowed from our own exertions, is yet sufficiently distinctive, and never leads us to confound things that are different, except in the language of some modern philosophers, who apply it to the laws of agency of mind; and, when speaking of the force of motives, &c., commit the same mistakes which the followers of Aristotle commit in the use of the term mind. Force, in the language of these philosophers, means what connects the operations of mind; as mind, in the language of lord Monboddo, is that which connects the operations of body. The doctrine of elemental minds, therefore, as the immediate causes of the phenomena of the material world, is an abuse of language. It is a jargon and a frivolous abuse, for it offers no explanation whatever. Of all mistakes that the naturalist can fall into, there is none more fatal to his progress in knowledge than the confounding things which are essentially different; and of all the distinctions which can be made among the objects of our contemplation, there is none of equal philosophical importance with this between mind and matter. When we consider the consequences which naturally follow from this confusion of ideas, and particularly those which follow from sinking the mental faculties of man to a level with the operations of mechanics or chemistry—consequences which the experience of the present day shows to be destructive of all that is noble or desirable in human nature, and of all that is comfortable in this life, and which blasts every hope of future excellence—we cannot be too anxious to have this capital distinction put in the plainest point of view. Such, then, are fairly the objects of this science, the subjects of philosophical study. The extent of the science is almost unbounded, reaching from an atom to God himself. It is necessary, for the successful cultivation of this immense field of knowledge, that it be committed to different cultivators, and that its various portions be treated in different ways.

Accordingly, the various tastes of men have given this curiosity different directions; and the study, like all other tasks, has been promoted by this division of labor. Some ingenious naturalists have attended only to the appearances of fitness, which are exhibited in every quarter of the universe; and by arranging these into different classes, and interpreting them as indications of thought and intention, have acquired the knowledge of many classes of sentient and intelligent beings, actuated by propensities, and directed by degrees of reason. While the contemplation of these appearances indicates thought and design in any individual of one of these classes, and brings its propensities and purposes of action, and the ends gained by these actions, into view, the contemplation of these propensities, purposes, and ends, itself occasions an inference of a much more general kind.

All these sentient beings give indications of knowledge and of power; but their knowledge bears no proportion to their powers of action and of attaining important ends; and their power is neither always, nor often, the consequence of their knowledge. Where the effects of their actions are most eminently conducive to their interests, the power of attaining these ends is generally independent on any attention to the fitness of the means, and their exertion is often made without their even knowing the end. The well-being of the individual is secured against danger by an instinctive propensity, which leads it to the performance of the necessary action, which is thus made immediately and ultimately desirable, without regard to its ultimate and important end. Thus, in our own nature, the support of animal life, and the improvement of the means of subsistence by a knowledge of the objects which surround us, are not entrusted to our apprehensions of the importance of these ends, but are committed to the surer guides of hunger and curiosity.

There is also a connexion between the individuals of a class, different from that which arises from the mere resemblance of their external appearance, or even of their propensities and pursuits. These propensities are such that, while each individual seeks only its own enjoyment, these enjoyments are in general such as contribute to the support of the species and the enjoyment of other individuals. Thus, in the classes of animals, and in human nature, the continuance of the race, and the enjoyment of the whole, are not entrusted to the apprehension we entertain of the importance of these ends, but are produced by the operation of sexual love and the love of society.

Even the different classes of sentient beings are connected together; and, while the whole of each class aim only at their own enjoyment, they contribute also to the well-being of the other classes. Man, the selfish lord of this sublunary world, is not the unconnected inhabitant of it. He cannot reap all the fruits of his situation, without contributing to the enjoyment of thousands of the brute creation. Nay, it has even been proved that while one race of animals, in consequence of its peculiar propensities, subsists by the destruction of another, the sum total of animal life and enjoyment is prodigiously increased. See a judicious dissertation on this curi- and puzzling subject, entitled A Philosophical Survey of the Animal Creation; where it appears that the increase of animal life and enjoyment which is produced by these means, beyond what could possibly obtain without it, is beyond all conception. See likewise King's Origin of Evil, edited by Dr. Law.

Thus the whole assemblage seems connected, and jointly employed in increasing the sum total of possible happiness. This fitness of the various propensities of sentient and intelligent beings, this subserviency to a general purpose, strikes these observers as a mark of intention, evidently distinct from, and independent of, all the particular intentions, and superior to them all; and thus it irresistibly leads them to infer the existence of a Supreme Mind, directing the whole of this intellectual system, while the individuals of which it consists appear the unconscious instruments in the hand of a great artist, with which he executes his grand and beneficent purposes.

But the observation goes yet further:—The bodies of the inanimate creation are not only connected with each other by a mutual dependence of properties, and the relation of causation, but they are also connected with the sentient beings by a subserviency to their purposes of enjoyment. The philosopher observes that this connexion is admirably kept up by the constancy of natural operations, and the expectations of intelligent beings. Had either of these circumstances been wanting, had either the operations of nature been without rule, or had sentient beings no perception or expectation of their uniformity, the subserviency would be totally at an end. This adjustment, this fitness, of which the effect is the enjoyment of the sentient inhabitants of the universe, appears to be the effect of an intention of which this enjoyment is the final cause. This constancy therefore in the operations of nature, both in the intellectual and material world, and the concomitant expectation of sentient beings, appear the effects of laws imposed on the different parts of the universe by the Supreme Mind, who has formed both these classes of beings so admirably suited to each other.

To such observers the world appears a work of art, a system of means employed for gaining certain proposed ends, and it carries the thoughts forward to an artist; and we infer a degree of skill, power, and good intention in this artist, proportioned to the ingenuity, extent, and happy effect which we are able to discern in his works. Such a contemplation of nature, therefore, terminates in natural theology, or the discovery of the existence and attributes of God.

Our notions of the Supreme Mind are formed from the indications of design which we observe, and which we interpret in the same way as in the actions of men. These notions, therefore, will differ from our notions of other minds only in the degrees which we are able to observe, and which we assign to these faculties; for the phenomenon or the effect is not only the mark, but also the measure of its supposed cause. These degrees must be ascertained by our own capacity of appreciating the extent, the multiplicity, and the variety of contrivance. Accordingly, the attributes of the Supreme Mind, in the theological creed of a rude Indian, are much more limited than in that of a European philosopher. In proportion as our understandings are enlarged, and as our acquaintance with the operations of nature around us is extended, we shall perceive higher degrees of power, of skill, and of kind intention: and, since we find that the scene of observation is unbounded, we cannot affix any boundaries to these attributes in our own imagination, and we are ready to suppose that they are infinite or unbounded in their own nature. When our attentive survey of this universe, and a careful comparison of all its parts as far as we can understand or appreciate them, have made us conclude that it is one design, the work of one artist; we are under the necessity of inferring that, with respect to this universe, his power, wisdom, and benevolence, are indeed infinite.

When men have been led to draw this conclusion from the appearances which are observed every where around them, they consider that constancy which they observe in natural operations, whether in the material or the intellectual system, and that expectation of, and confidence in, this constancy, which renders the universe a source of enjoyment to its sentient inhabitants, as the consequences of laws imposed by the Almighty artist on his works, in the same manner as they would consider the constancy in the conduct of any people as the consequences of laws promulgated and enforced by the supreme magistrate. There can be no doubt of this view of nature being extremely captivating, and likely to engage the curiosity of speculative men; and it is not surprising that the phenomena of mind have been keenly studied in all ages.

The occupations, however, of ordinary life have oftener directed our efforts towards *material* objects, and engaged our attention on their properties and relations; and as all sciences have arisen from arts, and were originally implied in the maxims and precepts of those arts, till separated from them by the curious speculatist, the knowledge of the material system of nature was possessed in detached scraps by the practitioners in the various arts of life long before the natural philosopher thought of collecting them into a body of scientific doctrines. But there have not been wanting in all ages men of curiosity who have been struck by the uniformity of the operations of nature in the material world, and were eager to discover their causes.

Accordingly, while the moralists and metaphysicians turned their whole attention to the phenomena of the mind, and have produced the sciences of pneumatology, logic, ethics, jurisprudence, and natural theology, these observers of nature have found sufficient employment in considering the phenomena of the material world.

The bodies of which it consists are evidently connected by means of those properties by which we observe that they produce changes in each other's situation. This assemblage of objects may therefore be justly called a system. We may call it the *material system*. It is frequently termed nature; and the terms natural appearances, natural causes, natural laws, have been generally restricted to those which take place in the material system. This restriction, however, is improper, because there is no difference in the manner in which we form our notions of these laws, and reason from them, both with respect to mind and body. Or if there is to be any restriction, and if any part of the study of the universe is to be excluded in the application of these terms, it is that part only which considers moral obligation, and rather treats of what ought to be than of what is. As has been already observed, there is a considerable difference in the language which must be employed; but still there is none in the principles of investigation. We have no proof of the extent of any moral law but an appeal to the feelings of the hearts of men, indicated by the general laws or facts which are observed in their actions. But this is only a question of the propriety of language. And no great inconvenience would arise from the restriction now mentioned if it were scrupulously adhered to; but unfortunately this is not always the case. Some authors use the term natural law to express every coincidence of fact; and this is certainly the proper use of the term.

The French writers generally use the term *loi physique* in this enlarged sense. But many authors, misled by, or taking advantage of, the ambiguity of language, after having established a law founded on a copious and perhaps unexpected induction of the phenomena of the material system (in which case it must be considered in its restricted sense), have, in their explanation of phenomena, extended their principle much farther than the induction on which they had founded the existence of the physical law. They have extended it to the phenomena of mind, and have led their followers into great and dangerous mistakes.

Physics, then, is with us the study of the material system, including both natural history and philosophy. The term is not indeed very familiar in our language; and, in place of physicus and disciplina physica, we more generally use the terms naturalist and natural knowledge. The term natural philosophy, in its common acceptation, is of less extent. The field of physical investigation is still of prodigious extent; and its different quarters require very different treatments, make very different returns, and accordingly have engaged in their particular cultivation persons of very different talents and tastes. It is of some importance to perceive the distinctions, and to see how the wants and propensities of men have led them into the different paths of investigation; for, as has been more than once observed, all sciences have sprung from the humble arts of life, and both go on improving by means of a close and constant correspondence.

All the *phenomena* of the material system may be arranged into two classes, distinguished both by their objects and by the proper manner of treating them. The first class comprehends all the appearances which are exhibited in the sensible motions of bodies, and their actions on each other, producing sensible motion. The second class comprehends the appearances which are exhibited in the insensible motions and actions of the invisible particles of matter.

Of the phenomena of the first class we have examples in the planetary motions, the motions of heavy bodies, the phenomena of impulse, the motions and actions of machines, the pressure and motions of fluids, the sensible actions of magnetical and electrical bodies, and the motions of light.

We have examples of the second class in the phenomena of heat and mixture, and those exhibited in the growth of animals and vegetables, and many phenomena of solid, fluid, magnetical, electrical, and luminous bodies, in which no change of place can be observed.

Thus it appears that there is a distinction in the phenomena sufficiently great to warrant a division of the study, and to make us expect a more rapid improvement by this division. Nay, the division has been made by nature herself, in the acquaintance which men have attained with her operations without study, before science appeared, and while art constituted all our knowledge.

In the phenomena of the first class, again, we see the immediate exertion of the connecting principle between the concomitant events, whatever it may be; we can observe the exertion with accuracy; we can determine its kind and degree: and this exertion, being always some modification of motion, allows us to call in the aid of mathematical knowledge, and thus to ascertain with precision the energy of the cause; judging of the tendency and quantity by the tendency and the quantity of the observed effect.

But in the second class of phenomena the case is very different. In the operations of chemistry, for instance, the immediate exertion of the cause is not perceived: all that we observe is the assemblage of particles which obtains before mixture, and that which takes place when it is completed, and which we consider as its result. The procedure of nature in producing the change is unseen and unknown. The steps are hid from our observation. We are not only ignorant of the cause which determines one particle of our food to become a part of our body, while others are rejected, but we do not see the operation. We are not only ignorant of the cause which determines a particle of vitriolic acid to quit the fossil alkali with which it is united in Glauber's salt, and to attach itself to a particle of magnesia already united with the muriatic acid, which also quits it to unite with the alkali, but we do not see the operation. The particles and their motions are not the objects of our senses; and all that we see is the Epsom salt and common salt separate from the water in which we had formerly dissolved the sal mirabile and the muriated magnesia. The motions, which are the immediate effects of the changing causes, and therefore their only indications, characteristics, and measures, fitted to show their nature, are hid from our view.

Our knowledge therefore of these phenomena must be less perfect than that of the phenomena of the former class; and we must here content ourselves with the discovery of more remote relations and remote causes, and with our ignorance of the very powers of nature by which these changes are brought about, and which are cognoscible only by their immediate effects, viz. the motions which they produce unseen. The knowledge which we do really acquire is somewhat similar to what the mechanical philosopher has acquired when he has discovered, by many experiments and investigations, that magnets attract each other by their dissimilar poles, and repel each other by their similar poles, and do not act at all on any bodies but loadstones and iron. Here we leave undiscovered all that is most curious in the phenomenon, viz. how these attractions and repulsions are produced; and even here the magnetical philosopher has the advantage of seeing the agents and the operation.

This distinction in the nature of the phenomena, and this difference in the nature of the knowledge which is to be acquired, and the means which are to be employed for the successful prosecution of these two branches of general physics, has occasioned a still further restriction (at least in Britain) of the term natural philosophy. It is particularly applied to the study of the phenomena of the first class, while those of the second have produced the sciences of chemistry and physiology.

Natural philosophy and chemistry have generally been made particular institutions in our seminaries of learning, but physiology has more commonly been taught in conjunction with anatomy, medicine, and botany.

The phenomena of the first class have been usually called mechanical, in order to distinguish them from those observed in the operations of chemistry, and in the animal and vegetable economy; and the explanations which have been attempted of some of the last, by applying the laws observed in the phenomena of the first class, have been called mechanical explanations.

As this first class is evidently but a part of general physics, there is some impropriety in giving the name natural philosophy to a course of doctrines which is confined to these alone. Indeed, at the first institution of universities, the lectures given in the Schola Physica were much more extensive, comprehending almost all the phenomena of the material world: but, as all arts and sciences have improved most where the labor has been most divided, it was found more conducive to the advancement of knowledge that separate institutions should be founded for the studies of natural history, chemistry, physiology, &c.; and thus the phenomena, purely mechanical, and a few others in magnetism, electricity, and optics, which either were susceptible of mathematical treatment, or had little connexion with the studies of chemistry and physiology, were left to the care of the professor of natural philosophy.

As the terms chemistry and physiology have been applied to two very important branches of general physics, we think that a more specific or characteristic name might be appropriated to the other, and that it might very properly be termed mechanical philosophy.

It only remains to make a few observations on the distinctive means of prosecuting these studies with success, and to point out some of the advantages which may reasonably be expected from a careful prosecution of them; and as the second branch is fully treated under the several articles of CHEMISTRY, PHYSIOLOGY, &c., we shall confine ourselves to what is usually called natural philosophy.

Mechanical philosophy may, in conformity with the foregoing observations, be defined, 'the study of the sensible motions of the bodies of the universe, and of their actions producing sensible motions with a view to discover their causes, to explain subordinate phenomena, and to improve art.'

The principle upon which all philosophical discussion proceeds is, that every change which we observe in the condition of things is considered by us as an effect, indicating the agency, characterising the kind, and measuring the degree of its cause. In the language of mechanical philosophy, the cause of any change of motion is called a moving or changing force. The disquisitions of natural philosophy must therefore begin with the consideration of motion, carefully noticing every affection or quality of it, so as to establish marks and measures of every change of which it is susceptible; for these are the only marks and measures of the changing forces. This being done, it only remains to apply them to the motions which we observe in the universe.

From the general principle of philosophical discussion already mentioned, there flow directly two axioms. 1. Every body perseveres in a state of rest or of uniform rectilineal motion, unless affected by some moving force. 2. Every change of motion is in the direction and in the degree of the force impressed.

These are usually called the laws of motion. They are more properly laws of human judgment with respect to motion. Perhaps they are necessary truths, unless it be alleged that the general principle, of which they are necessary consequences, is itself a contingent though universal truth. By these two axioms, applied in abstracto to every variety of motion, we establish a system of general doctrines concerning motions, according as they are simple or compounded, accelerated, retarded, rectilineal, curvilineal, in single bodies, or in systems of connected bodies; and we obtain corresponding characteristics and measures of accelerating or retarding forces, centripetal or centrifugal, simple or compound. We have an illustrious example of this abstract system of motion and moving forces in the first book of Sir Isaac Newton's Mathematical Principles of Natural Philosophy. Euler's Mechanica sive Scientia Motûs, Herman's Photonomia sive de Viribus Corporum, and D'Alembert's Traité de Dynamique, are also excellent works of the same kind. In this abstract system no regard is paid to the casual differences of moving forces, or the sources from which they arise. It is enough to characterise a double accelerating force, for instance, that it produces a double acceleration. It may be a weight, a stream of water, the pressure of a man; and the force, of which it is said to be double, may be the attraction of a magnet, a current of air, or the action of a spring. Having established these general doctrines, the philosopher now applies them to the general phenomena of the universe, in order to discover the nature of the forces which really exist, and the laws by which their operations are regulated, and to explain interesting but subordinate phenomena. This is the chief business of the mechanical philosopher; and it may with some propriety be called the mechanical history of nature.

Some method must be followed in this history of mechanical nature. The phenomena must be classed by means of their resemblances, which infer a resemblance in their causes, and these classes must be arranged according to some principle. We have seen no method which appears to us less exceptionable than the following:—The principle of arrangement is the generality of the phenomena; and the propriety of adopting this principle arises from the probability which it gives us of more readily discovering the most general actuating forces, whose agency is implicated in all other phenomena of less extent; and therefore should be previously discussed, that we may detect the discriminating circumstances which serve to characterise the subordinate phenomena, and are thus the marks of the distinguishing and inferior natural powers.

The most general of all phenomena is the curvilineal motion of bodies in free space; it is observed through the whole extent of the solar system.

The mechanical history of nature begins therefore with *astronomy*. Here, from the general phenomena of the planetary motions, is evinced the fact of the mutual deflection of every body towards every other body, and this in the inverse proportion of the squares of the distance, and the direct proportion of the quantity of matter. This is the fact of universal gravitation, indicating the agency, and measuring the intensity, of the universal force of mutual gravity. Having established this as a universal fact, the natural philosopher proceeds to point out all the particular facts which are comprehended under it, and whose peculiarities characterise the different movements of the solar system. That is, in the language of philosophy, he gives a theory or explanation of the subordinate phenomena; the elliptical motions of the planets and comets, their mutual disturbances; the lunar irregularities; the oblate figure of the planets; the nutation of the earth's axis; the precession of the equinoxes; and the phenomena of the tides and trade winds; and he concludes with the theory of the parabolic motions of bodies projected on the surface of this globe, and the motion of pendulums. As he goes along, he takes notice of the applications which may be made to the arts of life of the various doctrines which are successively established, such as chronology, astronomical calculation, dialling, navigation, gunnery, and the measuring of time. If a square parcel of sand be lying on the table, and the finger be applied to any part of it to push it along the table, that part is removed where you will, but the rest remains in its place; but if it is a piece of sand-stone of the same materials and shape, and the finger is applied as before, the whole is moved; the other parts accompany the part impelled by the finger in all its motions.

From the moon's accompanying the earth in all its motions round the sun we infer a moving force which connects the moon and earth. In like manner, we must conclude that a moving force connects the particles of the stone; for we give the name force to every thing which produces motion; we call it the force of cohesion; a term which, like gravitation, expresses merely a fact. This seems to be the next phenomenon of the universe in point of extent.

Having, from the general phenomenon, established the existence of this force, the philosopher proceeds to ascertain the laws by which its exertions are regulated; which is the ascertaining its distinctive nature and properties. This he does in the same way that he ascertained the nature of planetary gravitation, viz. by observing more particularly the various phenomena. And here is opened a most extensive and varied field of observation, in which it must be acknowledged that very little regular and marked progress has been made. The variety in the phenomena, and the consequent variety in the nature of the connecting forces, appear as yet inconceivably great; and there seems little probability of our being able to detect in them all any sameness, combined with the other distinguishing circumstances, as we have done in the case of gravity. Yet we should not despair.

Boscovich has shown, in the most unexceptionable manner, that although we shall suppose that every atom of matter is endued with a perfectly similar force, acting in a certain determined ratio of the small and imperceptible distances at which the particles of matter are arranged with respect to each other, the external or sensible appearances may, and must, have all that variety which we observe. He also shows very distinctly, how, from the operation of this force, must arise some of the most general and important phenomena which characterise the different forms of tangible bodies. We observe the chief varieties of the action of this corpuscular force on the bodies which we denominate hard, soft, solid, fluid, vaporous, brittle, ductile, elastic. We see instances where the parts of bodies avoid each other, and require external force to keep them together, or at certain small distances from each other. This is familiar in air, vapors, and all compressible and elastic bodies. This is evidently a most curious and interesting subject of investigation. On the nature and action of these corpuscular forces depend the strength or firmness of solids, their elasticity, their power of communicating motion, the pressure, and motion, and impulse of fluids; nay, on the same actions depend all the chemical and physiological phenomena of expansion, fusion, congelation, vaporisation, condensation, solution, precipitation, absorption, secretion, fermentation, and animal and vegetable concoction and assimilation.

Out of this immense store of phenomena, this inexhaustible fund of employment for our powers of investigation, the natural philosopher selects those which lead directly to the production or modification of sensible motion.

He will therefore consider.

1. The communication of motion among detached and free bodies, establishing the laws of impulse or collision. This has always been considered as the elementary doctrine of mechanical philosophy, and as the most familiar fact observed in the material world; amd in all ages philosophers have been anxious to reduce all actions of bodies on each other to impulse, and have never thought a phenomenon completely explained or accounted for till it has been shown to be a case of impulse. This it is which has given rise to the hypotheses of vortices, ethers, magnetic and electric fluids, animal spirits, and a multitude of fancied intermediums between the sensible masses of matter, which are said in common language to act on each other. A heavy body is supposed to fall, because it is impelled by a stream of an invisible fluid moving according to certain conditions suited to the case. The filings of iron are supposed to be arranged round a magnet by means of a stream of magnetic fluid issuing from one pole, circulating perpetually round the magnet, and entering at the other pole, in the same manner as we observe the floating grass arranged by the current of a brook. But the philosopher who has begun the mechanical study of nature by the doctrine of dynamics, and made its first application to the celestial phenomena, and who has attended carefully to the many analogies between the phenomena of gravitation and

cohesion will be at least ready to entertain very different notions of this matter. He will be so far from thinking that the production of motion by impulse is the most familiar fact in nature, that he will acknowledge it to be comparatively very rare; nay, there are some appearances, in the facts which are usually considered as instances of impulsion, which will lead him to doubt, and almost to deny, that there has ever been observed an instance of one body putting another in motion by coming into absolute contact with it, and striking it; and he will be disposed to think that the production of motion in this case is precisely similar to what we observe when we gently push one floating magnet towards another, with their similar poles fronting each other. There will be the same production of motion in the one and diminution of it in the other, and the same uniform motion of the common centre of gravity: and, in this case of the magnets, he sees completely the necessity of a law of motion, which is not an axiom, but is observed through the whole of nature, and which receives no explanation from any hypothesis of an intervening fluid, but is even totally inconsistent with them. We mean, that every action of one body on another is accompanied by an equal and opposite action of that other on the first. This is usually called the equality of action and reaction: it is not intuitive, but it is universal; and it is a necessary consequence of the perfect similarity of the corpuscular forces of the same kinds of matter. This general fact, unaccountable on the hypothesis of impelling fluids, is considered in the planetary motions as the unequivocal indication of the sameness of that gravity which regulates them all. The rules of good reasoning should make us draw the same conclusion here, that the particles of tangible matter are connected by equal and mutual forces, which are the immediate causes of all their sensible actions, and that these forces, like gravitation, vary with every change of distance and situation. The laws of collision and impulsion being now established, either as original facts or as consequences of the agency of equal and mutual force, which connect the particles of matter, the philosopher considers,

2. The production of motion by the intervention of solid bodies, where, by reason of the cohesion of matter, some of the motions are necessarily confined to certain determinate paths or directions. This is the case in all motions round fixed points or axes, or along planes or curves which are oblique to the action of the forces. This part of the study contains the theory of machines, pointing out the principles on which their energy depends, and consequently furnishing maxims for their construction and improvement. But these observations do not complete the discussion of the mechanism of solid bodies: they are not only solid and inert, but they are also heavy; therefore the action of gravity must be combined with the consequences of solidity. This will lead to discussion about the centre of gravity, the theory and construction of arches and roofs, the principles of stability and equilibrium, the attitudes of animals, and many particulars of this kind.

3. The philosopher will now turn his attention to another form, in which tangible matter exhibits many interesting phenomena, viz. fluidity. The first thing to be attended to here is, What is that particular form of existence? What is the precise phenomenon which characterises fluidity? What is the definition of a fluid? This is by no means an easy question, and considerable objections may be stated against any definition that has been given of it. Sir Isaac Newton says that a fluid is a body whose particles yield to the smallest impression, and by so yielding are easily moved among themselves. It may be doubted whether this be sufficiently precise; what is meant by the smallest impression? and what is easily moving? Is there any precise degree of impression to which they do not yield; and do they oppose any resistance to motion? And a stronger objection may be made. It is not clear that a body so constituted will exhibit all the appearances which a body acknowledged to be fluid does really exhibit. Euler offers some very plausible reasons for doubting whether it will account for the horizontal surface, and the complete propagation of pressure through the fluid in every direction; and therefore prefers selecting this last phenomenon, the propagation of pressure quaqua versum, as the characteristic of fluidity, because a body having this constitution (on whatever circumstances it may depend) will have every other observed property of a fluid. But this definition is hardly simple or perspicuous enough; and we think that the objections against Newton's more simple and intelligible definition are not unanswerable. Boscovich defines a fluid to be a body whose particles exert the same mutual forces in all directions; and shows that such particles must be indifferent, as to any position with respect to each other. If no external force act on them, they will remain in every position, and will have no tendency to arrange themselves in one position rather than another; differing in this respect from the particles of solid, or soft, or viscid bodies; which require some force to change their respective positions, and which recover these positions again when but gently disturbed. He illustrates this distinction very beautifully, by comparing a parcel of balls thrown on quicksilver, and attracting each other with a parcel of magnets in the same situation. The balls will stick together, but in any position; whereas the magnets will always affect a particular arrangement.

When the characteristic phenomenon of fluidity has been selected, the philosopher proceeds to combine this property with gravity, and establishes the doctrines of hydrostatics, or of the pressure, and equilibrium of heavy fluids, the propagation of this pressure in every direction; and demonstrates the horizontality of surface assumed by all perfect fluids. These doctrines and principles enable us to determine several very interesting circumstances respecting the mutual pressure of solids and fluids on each other; the pressures exerted on the bottoms and sides of vessels; the support and mechanism of floating bodies, &c.

He then considers how fluids will move when their equilibrium of pressure is destroyed; and establishes the doctrines of hydraulics, containing all the modifications of this motion, arising from the form of the vessels, or from the intensity or direction of the pressure which occasions it. And this subject is completed by the consideration of the resistance which fluids oppose to the motion of solid bodies through them, and their impulse on bodies opposed to their action. These are very important matters, being the foundations of many mechanical arts, and furnishing us with some of our most convenient and efficacious powers for impelling machines. They are also of very difficult discussion, and are by no means completely investigated or established. It is evident that on these doctrines depend the knowledge of the motions of rivers and of waves; the buoyancy, equilibrium, and stability of ships; the motion of ships through the waters; the action of the winds on the sails; and the whole arts of marine construction and seamanship.

There is another general form of tangible matter which exhibits very different phenomena, which are also extremely interesting; we mean that of vapor. A vapor is a fluid; and all the vapors that we know are heavy fluids: they are therefore subject to all the laws of pressure and impulse which have been considered under the articles HYDROSTATICS and HYDRAULICS. But they are susceptible of great compression by the action of external forces, and expand again when these forces are removed. In consequence of this compression and expansion, the general phenomena of fluidity receive great and important modifications; and this class of fluids requires a particular consideration. As air is a familiar instance, this branch of mechanical philosophy has been called PNEUMATICS.

The philosopher examines the law of compressibility of air and other elastic fluids: and thus obtains the knowledge of the constitution of the atmosphere, and of the actions of those fluids when employed to impel solid bodies. Gunpowder contains an immense quantity of permanently elastic air, which may be set at liberty by inflammation. When this is done at the bottom of a piece of ordnance, it will impel a ball along the barrel and discharge it from the muzzle in the same way that an arrow is impelled by a bow. And thus, having discovered in what degree this air presses in proportion to its expansion, we discover its action on the ball through the whole length of the piece, and the velocity which it will finally communicate to it. Here then is contained a theory of artillery and of mines.

Chemistry teaches us that most bodies can be converted by fire into elastic fluids, which can be employed to act on other bodies in the way of pressure or impulse. Thus they come under the review of the mechanical philosopher; and they have become interesting by being employed as moving forces in some very powerful machines. These discussions will nearly exhaust all the general mechanical phenomena. There remain some which are much more limited, but furnish very curious and important subjects of investigation.

The phenomena exhibited between loadstones or magnets and iron have long attracted attention; and the use to which the polarity of the loadstone has been applied, namely, the directing the course of a ship through the pathless ocean, has rendered these phenomena extremely interesting. They are specified by the term *magnetism*. Considerable progress has been made in the arrangement and generalisation of them; but we have by no means been able hitherto to bring them all under one simple fact. The attention has been too much turned to the discovery of the ultimate cause of magnetism; whereas we should rather have employed our ingenuity in discovering all the general laws, in the same manner as Kepler and Newton did with respect to the celestial phenomena, without troubling themselves with the cause of gravitation. Dr. Gilbert of Colchester was the first who considered the magnetical phenomena in the truly philosophical matter; and his treatise De Magnete may be considered as the first and one of the most perfect specimens of the Baconian or inductive logic. It is indeed an excellent performance; and when we consider its date, 1580, it is a wonder. Mr. Barlow is one of the latest successful experimenters in this department, and the important practical use to which his discoveries have been already put will be seen in our article MAGNETISM.

There is another class of mechanical phenomena which has a considerable affinity with the magnetical; we mean the phenomena called electrical. Certain bodies, when rubbed or otherwise treated, attract and repel other bodies, and occasion a great variety of sensible motions in the neighbouring bodies. Philosophers have paid much attention to these appearances, and established many general laws concerning them. But we have not been more successful in bringing them all under the fact, and thus establishing a complete theory of them, than in the case of magnetism.

And there are many phenomena of electricity which cannot be called mechanical, but are still of the most curious and interesting kind. As these have little connexion with any of the other great branches of physical science, they have generally been considered in treatises of natural philosophy; and, along with enquiries into the original cause of electricity in general, continue to engage much attention. See ELECTRICITY.

The appearances which are presented to us by our sense of seeing form another class, which have always been considered as making a branch of natural philosophy in all seminaries of learning. It does not, however, obviously appear, that they are mechanical phenomena. The nature of light is still a secret. Fortunately it is not necessary to be known to give us a very perfect theory of the chief phenomena. The general laws of *optics* are so few, so simple, and so precise, that our theories are perhaps more perfect here than in any other branch of physics; but these theories are as yet far removed from the rank of primary facts. Many unknown events happen before the phenomenon comes under the hands of the ordinary optician, so as to become the subjects of the simple laws of reflection and refraction. It may even be doubted, and has been doubted, whether the phenomena of optics are cases of body in motion; or whether all the lines which the optician draws are any thing but the directions along which certain qualities are exerted. See Optics and Vision.

The questions about the activity or inactivity of matter are not physical, but metaphysical. Natural philosophy, it is true, commonly takes it for granted that matter is wholly inactive; but it is not of any moment in physics whether this opinion is true or false: whether matter is acted on according to certain laws, or whether it acts of itself according to the same laws, makes no difference to the natural philosopher. It is his business to discover the laws which really obtain, and to apply these to the solution of subordinate phenomena: but whether these laws arise from the nature of some agent external to matter, or whether matter itself is the agent, are questions which may be above his comprehension, and do not immediately concern his proper business.

PHYSIOGNOMY.

PHYSIOG'NOMER, or, Physiog'nomist, *n. s.* Physiognom'ic, *adj.* Physiog'nomy, *n. s.* } Fr. *physionomiste, physionomie;* Gr. φυσιογνωμονια. One who professes to know the temper or disposition by the look or features: relating to the face or cast of countenance: the act or art of knowing the character or fortune by the face. See below.

In all *physiognomy*, the lineaments of the body will discover those natural inclinations of the mind which dissimulation will conceal, or discipline will suppress. *Bacon's Nat. Hist.*

Digonius, when he should have been put to death by the Turk, a *physiognomer* wished he might not die, because he would sow much dissention among the Christians. *Peacham.*

The astrologer, who spells the stars,
Mistakes his globes, and in her brighter eye
Interprets heaven's *physiognomy*. *Cleaveland.*
They'll find i' th' *physiognomies*
O' th' planets all men's destinies. *Hudibras.*

There is surely a *physiognomy* which master mendicants observe; whereby they instantly discover a merciful aspect, and will single out a face wherein they spy the signatures and marks of mercy. *Sir S. Browne.*

The end of portraits consists in expressing the true temper of those persons which it represents, and to make known their *physiognomy*. *Dryden's Dufresnoy.*

Apelles made his pictures so very like, that a *physiognomist* and fortune-teller foretold, by looking on them, the time of their deaths whom those pictures represented. *Dryden.*

The distinguishing characters of the face, and the lineaments of the body, grow more plain and visible with time and age; but the peculiar *physiognomy* of the mind is most discernible in children. *Locke.*

Let the *physiognomists* examine his features. *Arbuthnot and Pope.*

Physiognomy, Gr. φυσιογνωμια of φυσις, nature, and γνωσκω, has been called the science by which the dispositions of mankind are discoverable from the bodily form, and particularly from the features of the countenance. The term seems to have been introduced by Aristotle who thus lays down the leading principles of this study:—A peculiar form of body, he says, is invariably accompanied by a peculiar disposition of mind; a human intellect is never found in the corporeal form of a beast. The mind and body reciprocally affect each other: thus in intoxication and mania the mind exhibits the affections of the body; and, in fear, joy, &c., the body displays the affections of the mind. Hence, he argues, when in man a particular bodily character appears, which by prior experience and observation has been found uniformly accompanied by a certain mental disposition (with which therefore it must have been necessarily connected), we are entitled in all such cases to infer the disposition from the appearance. Our observations, he conceives, may be drawn from other animals as well as from men: for as a lion possesses one bodily form and mental character, a hare another, the corporeal characteristics of the lion, such as strong hair, deep voice, large extremities, discernible in a human creature, denote the strength and courage of that noble animal; while the slender extremities, soft down, and other features of the hare, visible in a man, betray the mental character of that pusillanimous creature. Upon this principle Aristotle treats of the corporeal features of man, and the correspondent dispositions, so far as observed: he illustrates them by the analogy just mentioned, and attempts also to account for them physiologically; distinctly noticing individual, national, and comparative physiognomy.

After Aristotle, his disciple and successor Theophrastus deserves to be mentioned as a writer on this subject. Polemon of Athens, Adamantius the sophist, and several others, wrote on the subject about the same period. Indeed from a modern collection of the Greek authors on physiognomy (Physiognomiæ veteris Scriptores Græci, Gr. et Lat. a Franzio Altenb. 1780, 8vo.), it would appear that the science was much cultivated in Greece; but the professors seem always to have connected with it much of the marvellous.

In the works of Hippocrates and Galen many physiognomical observations occur; and Cicero appears to have been attached to the science. In his oration against Piso, as well as in that in favor of Roscius, the classical reader will remember how the orator adapts physiognomy to his purpose. Physiognomical remarks are also to be found in the writings of Sallust, Suetonius, Seneca, Pliny, Aulus Gellius, Petronius, Plutarch, &c. It seems that in the Roman empire this science was even practised as a profession. Suetonius, for instance, in his life of Titus, states that Narcissus employed a physiognomist to examine the features of Britannicus, who predicted that he would not succeed, but that the empire would devolve on Titus.

From the beginning of the sixteenth century until the close of the seventeenth this was a very fashionable study. Within that period appeared almost all the approved modern authors on the subject, prior to Lavater. They are Bartholom. Cocles, Baptista Porta, Honoratus Nuqueties, Jacobus de Indagine, Alstedius, Michael Scottus, Gaspar Schottus, Cardan Taishierus, Fludd, Behmen, Barclay, Claromontius, Conringius, the commentaries of Augustin Niphus, and Camillus Balbus on the Physiognomica of Aristotle,—Spontanus, Andreas Henricus, Joannes Digander, Rud. Goclenius, Alex. Achillinus, Joh. Prætorius, Jo. Belot, Guliel. Gratalorus, &c. See Polyhistor. Morhoff. vol. I. lib. i. cap. 15. § 4, and vol. II. lib. iii. cap. 1. § 4.

During every period in which this pursuit has been in vogue, alchemy, magic, judicial astrology, the doctrine of signatures, and sympathies, or some other of the occult sciences has flourished. The first respectable writer on the subject in the eighteenth century was Dr. Gwyther. His remarks are published in the Philosophical Transactions, vol. xviii. Dr. Parsons, next chose it for the subject of the Croonian lectures, published at first in the second supplement to the forty-fourth volume of the Philosophical Transactions, and afterwards (1747) in a separate treatise. The observations, however, of these writers, as well as of Lancisius, Haller, and Buffon, relate rather to the momentary expression of the passions by the features than to any permanent system respecting them. The characters of Le Brun were illustrative of the same kind of transient physiognomy.

In the Berlin Transactions of the last century essays by Pernetty and Le Cat first drew the attention of the public to the modern system; and soon after the controversy between these parties Lavater's celebrated work appeared.

Accident, we are told, led him to the study of physiognomy; standing at a window with the celebrated Zimmerman, he was led to make such remarks on the singular countenance of a soldier who was passing as induced his friend to urge him to pursue his ideas. He accordingly began his work, and in process of time, with the natural progress of an enthusiastical mind, acquired not only a fondness for the study, but a full conviction of the reality of the physiognomical science, and of his own great discoveries in it. In 1776 he published the first fruits of his labors in a quarto volume, entitled Fragments. He took in them a wide range of enquiry, and carried his ideas beyond the observation of those parts of the countenance which exhibit to a common eye the impressions of mental qualities and affections; maintaining, as a leading position, 'that the powers and faculties of the mind have representative signs in the solid parts of the countenance.' Two more volumes appeared in succession, which presented a most extraordinary assemblage of subtle and refined reasoning, delicate feeling, and philanthropical and pious sentiment, together with a large admixture of mysticism, paradox, and extravagance. The whole work was illustrated with engravings; many of which were highly finished and expressive. It was soon translated into the French and English languages, and became the favorite topic of literary discussion.

In pointing out the distinguishing traits of different nations, Lavater observes, that the placing of several persons together, selected from nations remotely situated from each other, gives at one glance their great varieties of visage; yet he acknowledges that to point out those variations is a task of considerable difficulty. The French, he thinks, do not possess equally commanding traits with the English, nor are they so minute as those of the Germans, and it is to the peculiarities of their teeth, and manner of laughing, that he attributed his power of deciding on their origin. The Italians he appropriated by the form of their noses, their diminutive eyes, and projecting chins. The eye-brows and foreheads are the criterion by which to judge of the natives of England. The Dutch possess a particular rotundity of the head, and have weak, thin hair: the Germans, numerous angles and wrinkles about the eyes and in the cheeks; and the Russians are remarkable for black and light colored hair, and flat noses. Judging from the ladies he had seen of our country, and from numerous portraits of others, Lavater was led to say, they appeared to him wholly composed of nerve and marrow, tall and slender in their forms, gentle, and as distant from coarseness and harshness as earth from heaven.

Our author commences his analysis of the human face with the forehead; and, anticipating the discoveries of our phrenological friends, he here observes that the general form, proportion, arch, obliquity, and position of the skull of the forehead, denote the degree of thought, sensibility, mental vigor, and prepensities of the man: at the same time the skin of this part of the head explains, by its hue, tension, or wrinkles, the state of the mind at the moment of observation, and the passions which influence it: he seems to have been the first who attended to the peculiar turns of the position and outline of the forehead, which he considered the most important part presented for the study of the physiognomist. This he divides into three classes, the perpendicular, the projecting, and the retreating forehead, each possessing a number of variations: the principal, however, are rectilinear, 'half round, half rectilinear, flowing into each other; half round, half rectilinear, interrupted; curve-lined, simple; the curve-lined double and triple.' A long forehead indicates capacity of comprehension, and less activity; a compressed, short, and firm, forehead, more compression, stability, and little volatility; severity and pertinacity belong to the rectilinear; and the more curved than angular portends flexibility and tenderness of character: deficiency of understanding is discoverable in those whose foreheads are perpendicular from the hair to the eye-brows; but the perfectly perpendicular, gently arched at the top, signifies that the possessor thinks coolly and profoundly. The projecting forehead indicates stupidity and mental weakness; the retreating, exactly the reverse; the circular, and prominent above, with straight lines below, and nearly perpendicular, shows sensibility, ardor, and good understanding; the rectilinear oblique forehead has the same properties; arched foreheads are considered as feminine; a union of curved and straight lines, happily disposed, with a similar position of the forehead, gives the character of consummate wisdom. 'Right lines, considered as such, and curves, considered as such, are relaxed, as power and weakness, obstinacy and flexibility, understanding and sensation.' When the bones surrounding the eye project, and are sharp, the person thus formed possesses strong mental energy. Perpendicular foreheads, which, however, project so as not to rest on the nose, and which are short, small, shining, and full of wrinkles, give undoubted indications of weakness; perseverance and oppressive violent activity, united with harshness, belong to the forehead composed of various confused *protuberances;* and, on the other hand, when the profile of this part of the head affords two well-proportioned arches, the lowest projecting, it is a certain sign of a good temperament and a sound understanding. All great and excellent men, we are assured, have been found to have their eye-bones firmly arched, and well defined; and circumspection, followed by stability, attends square foreheads, with spacious temples, and eye-bones of the above description. Deep indentures in the bones of the forehead, between the eye-brows, and extending in a perpendicular direction, mark the happy few who possess generous and noble minds, connected with excellence of understanding.

Lavater afterwards describes the characteristics which, he asserts, give 'the indubitable signs of an excellent, a perfectly beautiful and significant, intelligent, and noble forehead.' It must be one third of the face in length, or that of the nose, and from the nose to the chin; the upper part must be oval, 'in the manner of the great men of England,' or nearly square; the skin must be smooth, and wrinkled only when the mind is roused to just indignation, or deeply immersed in thought, and during the paroxysm of pain; the upper part must recede, and the lower project; the eye-bones must be horizontal, and present a perfect curve upon being observed from above; an intersecting cavity should divide the forehead into four distinct parts, but with that slight effect as to be only visible with a clear descending light: and all the outlines should be composed of such, that, if the section of one-third only is observed, it would be difficult to decide whether they were circular or straight. To conclude this portrait of a transcendant forehead, the skin must be more transparent, and of a finer tint than the remainder of the face. Should an infant, or relative, who possesses a forehead of the above description, seriously err, our physiognomist is assured that 'the latent seeds of virtue' may still be roused to growth, and will produce sooner or later the desired harvest. We have, at the hazard of prolixity, followed him through this doctrine of the forehead, that it may be duly compared with the discoveries so ably advocated in a portion of our article on PHRENOLOGY. We are quite captivated with the additional advantage of the discriminating 'wrinkles.'

Blue *eyes* are considered by Lavater to indicate weakness and effeminacy of character, yet he acknowledged that many eminent men have had blue eyes; still he was convinced that strength and manhood belong more particularly to the brown. Benevolence, tenderness, timidity, and weakness, are said to be exhibited by the perfectly semi-circular arch formed by the under part of the upper eye-lid; persons of acute and solid understandings have a generous open eye, composing a long and acute angle with the nose; and, when the eye-lid forms a horizontal line over the pupil, it is a strong indication that he who possesses it is subtle and penetrating. The compressed firm eye-brow, formed of parallel hairs, is a certain proof of profound wisdom, true perception, and a manly, firm habit of thought. There are eye-brows which meet across the nose; this circumstance gives the person an air of ferocious gloom, which is admired by the Arabs; but the ancients, versed in physiognomy, conceived such to be the characteristic of cunning: Lavater, on the contrary, observes, that he had discovered them on the most worthy and open countenances, admitting at the same time that they may denote a heart ill at ease. Those who think profoundly, and those equally prudent and firm in their conduct, never have high and weak eye-brows. Thick angular eye-brows, interrupted in their lengths, signify spirit and activity; and, when they approach the eyes closely, the more firm, vigorous, and decided, is the character. White eye-brows are demonstrative of weakness.

Of the *nose* he says, 'Its length should equal the length of the forehead; at the top should be a gentle indenting; viewed in front, the back should be broad, and nearly parallel, yet above the centre something broader; the bottom, or end of the nose, must be neither hard nor fleshy, and its under outline must be remarkably definite, well delineated, neither pointed nor very broad; the sides, seen in front, must be well defined, and the descending nostrils gently shortened; viewed in profile, the bottom of the nose should not have more than one-third of its length; the nostrils above must be pointed below, round, and have in general a gentle curve, and be divided into equal parts by the profile of the upper lip; the side, or arch of the nose, must be a kind of oval; above, it must close well with the arch of the eye-bone, and near the eye must be at least half an inch in breadth. Such a nose is of more worth than a kingdom.' Socrates, Lairesse, and Boerhaave, are admitted, however, to have been great men, who had ill-shaped noses.

Lavater expatiates on the *mouth* also with enthusiastic fervor; 'Whoever,' he exclaims, 'internally feels the worth of this member, so different from every other member, so inseparable, so not to be defined, so simple, yet so various; whoever, I say, knows and feels this worth, will speak and act with divine wisdom.' He then proceeds to call it 'the chief seat of wisdom and folly, power and debility, virtue and vice, beauty and deformity, of the human mind; the seat of all love, all hatred, all sincerity, all falsehood, all humility, all pride, all dissimulation, and all truth.'

The character is further proclaimed in the lips, the more firm the latter the more fixed the former; the weak and irresolute man has weak lips, with rapidity in their motion. The vicious, cringing, mean, and bad countenance is never formed with lips well defined, large, and justly proportioned to the other parts of the face, and the line of which is equally serpentine on each side; such, though they may denote a tendency to sensuality, belong exclusively to a character deserving of admiration. A mouth the lips of which are so thin as to present, at first view, little more than a line, is said to indicate apathy and quiet, but industrious when roused. When this description of mouth is raised at the extremities, vanity or vain pretensions, affectation, and probably deliberate malice, distinguish those so formed. The opposite of this kind of lips, swelled into considerable size, is a mark of indolence and sensuality. The 'cut through, sharp drawn lip,' as Lavater terms it, has to contend with avarice and anxiety. Lips closed accurately, without exertion, and handsome in their outline, belong to the exercise of discretion and firmness. Lips with the latter advantage, and the upper projecting, are generally appropriated to the virtuous and benevolent, though there are, without doubt, numberless persons of excellent character whose under lips project, but, in Lavater's opinion, the last peculiarity implies a well-meaning man, whose goodness consists rather of cold fidelity than ardent friendship. The under lip, hollowed in the middle, denotes a fanciful character. 'Though physiognomists,' adds Lavater, 'have as yet but little noticed, yet much might be said concerning the lips improper, or the fleshy covering of the upper teeth, on which anatomists have not, to my knowledge, yet bestowed any name, and which may be called the curtain, or pallium, extending from the beginning of the nose to the red upper lip proper. If the upper lip improper be long, the proper is always short; if it be short and hollow, the proper will be large and curved;—another certain demonstration of the conformity of the human countenance. Hollow upper lips are much less common than flat and perpendicular; the character they denote is equally uncommon. A mouth naturally falling open is indicative (naturally enough we should think) of a disposition to complain: the mouth remaining naturally closed of endurance and courage.

The projecting *chin* is said to mark something decided, and the receding the reverse. The presence or absence of strength is frequently demonstrated by the form of this part of the countenance. Sudden indentings in the midst of the chin are peculiar to men of excellent cool understandings, unless attended by marks of a contrary tendency; 'when the chin is pointed, those so formed are supposed to be penetrating and cunning. The chin, it is said, offers a certain criterion for the physiognomist, who may securely pronounce a large fat double chin an appendage of gluttony. 'Flatness of chin speaks the cold and dry; smallness, fear; and roundness, with a dimple, benevolence.'

It is scarcely to be supposed that modesty was very predominant in our author's physiognomy when he adds, 'No one whose person is not well formed can become a good physiognomist. Those painters were the best whose persons were the handsomest. Rubens, Vandyke, and Raphael, possessing three gradations of beauty, possessed three gradations of the genius of painting. The physiognomists of the greatest symmetry are the best. As the most virtuous can best determine on virtue, so can the most handsome countenances on the goodness, beauty, and noble traits of the human countenance, and consequently on its defects and ignoble properties. The scarcity of human beauty is the reason why physiognomy is so much decried, and finds so many opponents. No person, therefore, ought to enter the sanctuary of physiognomy, who has a debased mind, an ill-formed forehead, a blinking eye, or a distorted mouth.'

It has been correctly observed, however, that although the science has fallen into disrepute, there can scarcely be mentioned a period in which any cultivation of science took place when physiognomy was not likewise the study, nay, sometimes even the profession, of men of the most eminent abilities and the greatest learning.

PHYSIOLOGY.

PHYSIOL'OGY, *n. s.* Fr. *physiologie*; Gr. φυσις and λεγω. The doctrine or constitution of the works of nature.

Disputing *physiology* is of no accommodation to your designs. *Glanville.*

Some of them seem rather metaphysical than *physiological* notions. *Boyle.*

Philosophers adapted their descriptions of the Deity to the vulgar, otherwise the conceptions of mankind could not be accounted for from their *physiology*. *Bentley.*

Physiology, in its largest extent of signification, means the science of nature, compounded as it is of the words φυσις (nature), and λογος (a discourse). It is more usually, however, restricted to that department of physical knowledge which relates to organic nature exclusively; and indeed, when the word is used without any adjective specification, it is more usually limited to animal life, vegetable physiology being generally treated of as a separate branch of enquiry.

In compliance with these restricted views we shall consider the subject on the present occasion, and the article which we are now about to draw up will principally apply to the nature and functions of the human body; occasional illustrations will of course be introduced from the vegetable and brute creation; but organised living man will stand the prominent and particular object of our discourse.

The plan which we shall pursue will be, first, to treat of the properties of life generally, and afterwards consider the several faculties and functions which life in its highest state of existence unfolds to view. On some of these functions we shall be thought perhaps to dwell with disproportionate minuteness; but it ought to be recollected that as much curtailment as is consistent with explicit discussion must be necessarily aimed at, and that, although in an essay which professes to take in the whole circle of animate being it will be proper to recognise all its parts, some of the parts, in a work like ours, fall to be considered in other places, and that, therefore, such an amplification as would otherwise be due to the general enquiry would prove in the present case but useless repetition. Under the word BRAIN, for instance, and as a single illustration of our meaning, the reader will meet with matter which, but for the necessity of conforming to alphabetical arrangement, might have stood over for disquisition in this article.

Another reason may be given for the comparative brevity of the present paper, viz. that we propose to separate as much as possible physiological from anatomical investigation, conformably with the views pointed out under the article ANATOMY; and, although here and there it will be necessary to hint at structure as connected with function, yet we shall but with little exception suppose our readers to be acquainted with the anatomy of the organs whose properties and peculiarities we are about to trace.

On the very threshold of our argument we must, however, in some sort depart from this general principle and purpose; for it would be improper to engage in an investigation of living properties without calling the reader's attention to the fact that physiologists have ever been busy in endeavouring to ascertain the precise nature of organic compages, as it relates to ultimate structure; and in this endeavour one great difficulty immediately presents itself, viz. the impossibility of dividing the organic or living, from the inorganic or more material part of the organisation. Life as a property resides in or is diffused through the whole of an animated machine, and although there are some parts, as for example the hard substance of bone, in which vitality seems as it were at a lower ebb than in others, yet this perhaps is merely in appearance; for from the moment that organic properties are destroyed, even in bone, that bone ceases to be an integral portion of the body, to which hitherto it had been attached, and is no longer useful as portion and parcel of the body, but is separated and thrown off, either by the efforts of nature or the interposition of art.

And this leads us to remark on the great leading distinction between organic and inorganic matter; or, to employ phraseology which would be less obnoxious to objection, between organic existence and mere matter, which is indivisibility or mutual connexion of parts with the whole—a connexion which is displayed even in vegetable organisation; for a branch from a tree, equally with a limb from the body of an animal, ceases to exist as an organised being by itself, and soon upon separation becomes subjected to other laws than those of life. But this life, whatever it is, and we shall have a word or two further to say on this head in the course of our enquiries, is appended to or connected with, in some way or other, a material fabric, and the ultimate composition of this fabric has ever been a source of speculative enquiry.

Our forefathers in philosophy were contented with generalising the phenomena of nature under an elementary division of fire, air, earth, and water, and in a very vague way it must be owned applied these elementary principles to the explication of organised substances; thus the hardest parts, as the bones, they supposed to partake of the hardest of their elements, and by an admixture and different proportion of the other elements did they imagine the solids and fluids of living existence to be constituted. But even in the inanimate creation these elementary views have given way to a juster mode of philosophising, and it is now generally admitted that a confusion obtained among the ancient observers of nature, founded on their want of distinction between quality and substance, and by their assuming simplicity of existence, which further researches might and have proved to be compound—as in the case of air, which every tyro now knows to be any thing but a simple element.

We do not indeed feel quite sure whether some of our more modern physiologists have not been rather too forgetful of this impossibility of terminating our researches at a fixed point, when they have been anxiously endeavouring to trace organic existence up to its elementary sources; although it must be confessed that researches of this kind are in the present day pursued in a better spirit of philosophising, and under the general feeling that more and more of the works and wonders of nature may be unfolded to our view, as we multiply the means of our investigations, and do not go upon the assumption that we see every thing because a present horizon terminates our present views; that it is in the very nature of all material science to have no bounds; that we must avoid both giving laws and giving limits from our own imaginations, and be always careful to guard against confounding the notions of final and efficient cause, or of thinking of what we ought to see rather than of what we do see.

There is one very great difficulty connecting itself with our endeavours to unravel organised matter and trace it to its outward bounds, which arises from the circumstance of living existence being so completely an imperium in imperio. Thus, if we suppose a given structure, say of fibre, or to express the minuteness of the thing fibrilla, to be the principle in which all organised being is resolvable; we are impeded in this sweeping inference by the recollection that this very fibre is itself while part of the organised fabric necessarily made up of vessels and nerves—vessels to circulate blood through it and nerves to give it susceptibility,—that again these vessels and nerves must themselves be compounded of fibrous or of membraneous tissue,—and that thus they are mutually adinfinitum structurally, if we may so say, subservient to each other.

Having thrown out these intimations respecting the intricacies connected with the investigation of structural primordia, we shall now proceed to give the reader an insight into what modern endeavours have accomplished on this head, both in the way of demonstration and inference; and we do not know that we can accomplish this task better than by copying the following very long note of Dr. Copland which he has appended to that part of Richerand's Physiology which refers to primary and essential structure.

M. Richerand very sensibly remarks that the simple or elementary fibre, about which so much has been written, may be considered as the philosopher's stone of physiologists. In vain, he says, Haller himself in his pursuit of his chimera told us that the elementary fibre is to the physiologists what the line is to the geometer; and that, as all figures are formed from the latter, so are all the tissues formed from this fibre; fibra idem physiologo est quod linea geometræ, ex qua nempe figuræ omnes oriuntur. The mathematical line is imaginary, and a mere abstraction of the mind, while the elementary fibre is allowed a material or physical existence. Nothing, therefore, can make us admit the existence of a simple elementary or primitive fibre, since our senses show us, in the human organisation, four very distinct materials. These materials Richerand in another place states to be cellular, nervous, muscular, and horny tissue.

Let the reader, however, bear in mind what we have just advanced in reference to the qualification with which even such divisions as these should be received or adopted; and with this recollection let him read attentively the following extract from Dr. Copland's valuable edition of Richerand, to which we have just referred.

'The intimate or elementary constitution of the animal texture has long engaged the attention of anatomists and physiologists. As researches respecting this subject can only be prosecuted by means of the microscope the results must therefore be received with some degree of reservation, unless they coincide with the observation of former enquirers or be confirmed by subsequent observers. From amongst those who have been engaged in this species of investigation J. F. Mickel is entitled to much confidence on account of his talents and industry; and the results of his labors claim particular notice, as they confirm much that has been recorded by former observers.'

According to the views of this physiologist the solids and fluids of the human body may be reduced to two elementary substances; the one is formed of globules, the other of a coagulable matter which either alone or united to the former constitutes the living fluids when it is in the liquid state, and gives rise to the solid tissues when it assumes a concrete form.

The globules present in their nature and aspect differences which are relative to the situations in which they are examined. They appear in the blood flattened, and composed of a central part, which is solid, and of an exterior portion, which is hollow and vesicular. Those found in the kidneys are smaller than those of the spleen, and the globules of the liver are still smaller. Those contained in the substance of the nerves present a less volume than those observed in the blood.

Globules exist not, according to Mickel, in the proper structure of the cellular tissues, of fibrous and cartilaginous parts, and of the bones. On the contrary, they abound in nerves and muscles, and determine their nature and color. Some of the fluids also, as the urine, contain no globules, whilst they are abundant in the blood, in the chyle, the lymph, the milk, &c.

During the first period of conception the mucous and homogeneous mass which constitutes the embryo contains no globules; it is not until a more advanced period that it is composed of two substances, the one fluid the other solid. These two elements seem to influence the form of the fibres and plates in which animal substances are disposed. The laminated tissues arise almost exclusively from the fluid matter. The fibrous tissues may also be produced from this matter alone, as in the tendons, &c.; they are, however, more frequently formed from the union of the globules with the concretive fluid, as may be observed in the nervous and muscular textures.

These observations of Mickel respecting animal organisation, it ought to be noticed, bear a near resemblance to the opinions entertained by Pfaff, who considered the elementary tissues tc be formed from a series of molecules and globules, and to be different according to the presence and influence of the latter form of matter. The idea of a fluid substance capable of concretion is analogous to the opinion of the ancients respecting the substance denominated by them gluten. It is the cellular tissue, according to Mickel, which represents that substance; and in fact he regards this tissue as a species of concrete fluid, possessed of the properties already indicated.

It must, in our opinion, be admitted that the theory of Mickel possesses claims to a favorable notice. It is the result of observations which accord with those of others; it is also simple, and is easily to be reconciled with the phenomena which living texture presents.

Dr. Meyer of Bonn also considers that two kinds of elementary textures exist in animal bodies; the one is, according to him, composed chiefly of capillary vessels, and is formed from an assemblage of these vessels; under it he arranges cellular, serous, fibrous, and mucous tissues; the other possesses a proper and peculiar parenchyma, composed of globules, or of an organic pulp; such are the glands, the bones, the muscles, nerves, brain, and spinal chord. The first set of organs is a continuation, in his opinion, of the vascular system; while the second, on the contrary, is further removed from such a connexion. Foreign substances introduced into the circulation pass immediately and with rapidity into the former textures, while they either fail altogether in penetrating or insinuate themselves much more slowly, and after quite a different manner, into the parenchyma of the latter organs. The one class seems to appertain in general to the system of secretion; the other class of textures neither secrete from their individual influence, nor can they of themselves add to their nutrition. The first appears to be nourished by the immediate, rapid, and continual access of the fluid parts of the blood; the second by a slow and periodic disposition, and conversion into their proper substance of the sanguineous globules of the blood by means of the influence of the vascular extremities upon the blood which they contain.

The primary solids, or rather the elementary fibres of the human body, and of the higher classes of animals, cannot be considered with propriety to be more than three—the *cellular* or *laminar*, the *muscular*, and the *nervous*.

1. The *cellular* fibre is the most essential to animal existence, and is found in every individual of this kingdom. It consists of an assemblage of minute laminæ and distinct filaments. It is neither sensible nor irritable, and is chiefly composed of a nearly concrete gelatine.

2. The *muscular* fibre is not so generally distributed throughout the animal kingdom as the former, for it is not found in the zoophites.

3. The *nervous* or medullary fibre. The nature of this tissue has been the subject of much investigation. M. de Bainville thinks that it originates in the muscular fibre, as this latter takes its origin in the cellular substance.

To these fibres professor Chaupier has added a fourth, namely, the *albugineous* fibre which is saline, white, and very strong; and is neither sensible nor irritable. The majority of anatomists, however, consider it as merely a very condensed cellular fibre

These fibres may be called the first order of the solids, as they serve to form all the other tissues and organs of the body. The cellular substance, for instance, is spread out and condensed into membranes, or rolled up in the form of vessels; muscular fibres also assume the form of membranes, concur to the formation of vessels, and constitute muscles; nervous fibres produce the nerves, &c. Finally, those primary solids associate in various forms, and give rise to the compound solids, as the bones, the glands, &c.; and even to those of a more complex nature, as several of the thoracic and abdominal viscera. Indeed every species of solid has for its base the cellular substance which is penetrated by nerves and vessels. The viscera, for example, are of this nature, having moreover a membraneous envelope. The bones also consist of a similar texture, and of a deposition also of phosphate of lime in their cellular substance.

Those primary solids, or most simple anatomical constituents which we have just now particularised, associate in various forms, giving rise to compound solids or tissues which are characterised not only by their form and nature, but also by the faculties which they perform.

These animal textures or compound solids were first arranged, with any degree of accuracy, by Richat; and however successful future researches into their ultimate nature may be, or whatever classification may be proposed by future enquirers, he is still entitled to the honor of having introduced a philosophical analysis into anatomical and physiological science. The arrangement of the tissues which this great man adopted is as follows:—the exhalant, absorbent, cellular, arterial, viscous, nervous of animal life, nervous of organic life, osseous, medullary, cartilaginous, fibro-cartilaginous, fibrous, muscular of animal life, muscular of organic life, mucous, serous, synovial, glandular, dermoid, epi-dermoid, and corneous or pilous system. Madelon has lately proposed another classification, possessing some advantages over that of Richat. He has reduced the number of textures, or systems, to twelve, viz. the cellular, nervous, osseous, cartilaginous, fibrous, muscular, erectile, mucous, serous, corneous or epidermoid, and parenchymatous.

Professor Mayer has recently adopted a classification of the animal textures of compound solids, founded on his views respecting the elementary fibres or primary solids. He recognises only seven systems, viz. the lamellated tissue, 2d. the cellulo-fibrous tissue, 3d, the fibrous system, 4th, the cartilaginous tissue, 5th, the osseous tissue, 6th, the muscular fibre, and 7th, the nervous tissue.

The arrangement of this class of solids which we would propose is the following:—Employing the term tissue generally, we would divide the compound solids of the body into two classes, viz. general systems, and particular textures.

1. *General systems.*—Under this class we would arrange, 1st, the cellular system; 2d, the nervous system, which comprehends two orders, viz. A, the involuntary or ganglial order of nerves, or the system of the great sympathetic—and B, the voluntary order of nerves; 3d, the muscular system, which also embraces two orders, A, the involuntary order of muscular fibres: B, the voluntary order of muscular fibres; 4th, the vascular system; this system has four orders, viz. A, the arterial order of vessels; B, the capillary order; C, the venous order; D, the absorbent vessels, including, *a*, the lymphatics, and *b*, the lacteals.

2. *Particular textures.*—This class includes, 1st, the mucous textures; 2d, the serous textures; 3d, the fibrous textures, embracing the fibrous, the fibro-cartilaginous, and the dermoid; 4th, the cartilaginous textures; 5th, the osseous textures; 6th, the orictile textures; 7th, the glandular textures, including the parenchyma of the viscera; 8th, the corneous textures, embracing, A, the pilous, and B, the epidermoid textures.

Proceeding synthetically, we may arrange all the solids of which the animal body is composed after the following manner:—

Class 1st, or *Elementary animal solids.*

The cellular fibre.	The nervous fibre.
The muscular fibre.	

Class 2nd, *Secondary* or *Compound animal solids*

Order I.—General systems.

The cellular system, including the adipose tissue.	The nervous systems
	A. The involuntary or ganglial order of nerves, or system of the great sympathetic.
	B. The voluntary order of nerves.
The muscular system.	The vascular system.
A. Involuntary muscles.	A. Arterial vessels.
B. Voluntary muscles.	B. Venous vessels.
	C. Absorbents.
	a. Lymphatic absorbents.
	b. Lacteal absorbents.

Order II.—Particular textures.

Mucous textures.	Serous textures.
Erectile textures.	Fibrous textures.
	A. The fibrous.
	B. Fibro-cartilaginous textures.
	C. Dermoid textures.
Glandular textures.	Corneous texture.
Cartilaginous textures.	A. The epidermoid.
Osseous textures.	B. The pilous.

Class 3d, *Associated*, or *complex animal solids*.

Order I.—Organs of nutrition.

Digestive organs.	Organs of absorption and circulation.
Organs of respiration and assimilation.	Organs of secretion and animal heat.

Order II.—Organs of relation.

Organs of sensation.	Organs of voluntary motion.

Order III.—Organs of reproduction.

Organs of generation in both sexes.

We have made this long extract from Dr. pland, because we think it presents as concentrated a view as any we have met with respecting the labors of physiological analysts in reference to ultimate structure. It will be afterwards seen, when we are upon the nervous system, as indeed the above extract intimates, that Dr. C. is partial to those views which regard the primordia of all the textures to be a globular formation. This view (and some of his intimations deserve the credit of novelty as well as ingenuity) has been taken up in different ways by other physiologists, especially by Dr. Edwards of Paris, but still more recent investigators have questioned the accuracy of Dr. E.'s inferences, and indeed the whole business of ultimate or primordial organisation is exceedingly obscure, or but dimly seen, and that partly from the causes we have already pointed out.

But as well on the head of properties as construction opinion is in some measure different, although part of the diversities, as we shall immediately see, depends upon the difference of signification which is affixed to terms.

It will be recollected we stated above that the grand distinguishing feature of life is indivisibility or totality, or, as it may be expressed, mutual connexion and dependence of one part upon another. Break a stone into two equal fragments, and each part preserves the same identity as before the division—not so with substance that is organised; for in this last a connecting or central principle exists which is destroyed by separation, and the separated parts —parts separated from the centre—immediately lose their organic properties, and become subject to new laws. It may be said that an exception obtains to this law in some of the zoophites and vermes; but there is no point of fact, no exception even in these examples, because, in cases where life is preserved after separation, the being thus treated may be considered either as a series of beings each having its own central vitality, or to be so low in the scale of organisation as to be only admissible as a connecting link with the inorganic world.

This principle of indivisibility has been well expressed we believe by Richerand in the following words :—' The mode of existence in living bodies resides in the whole, while each part of inanimate matter belongs to itself.'

Setting out then with a recognition of this leading characteristic of organisation, we are further to enquire into the fundamental properties which organisation manifests. We must premise that the usual divisions of organised beings is into animal and vegetable; the former possessing those faculties from which result sensation and loco-motion, the latter being destitute of such faculties. Some indeed have supposed that this division is untenable, and that wherever there is organisation there is some sort of sensation, or rather of sensibility; but it is not within our present province to enter into this question, since it is only animal physiology with which we are now to be engaged.

Now a faculty to which the word irritability has been appropriated is decidedly a faculty of organisation exclusively; it is the power or property of contracting upon the application of certain excitants or stimuli; but with this excitation there is often a simultaneous consciousness of the effect, and in that case the physiologist says there is another faculty brought into exercise, namely, sensibility. And so far there is no difficulty; but this last power or property, besides being different in different parts and in different circumstances of the individual so as to vary in degree and in kind, is often manifested in such sort as that the parts and organs implicated seem to have perception without that perception calling forth consciousness; and it hence becomes a question whether this faculty belongs to irritability or sensibility, or rather by what term it should be designated.

It should seem, says Richerand, that no part of the body can do without a species of sensibility, which is absolutely necessary for life. Without it how could various organs act upon the blood to draw from it the means of their nutrition or materials for the different secretions? Therefore this degree of sensibility is common to every thing which has life, to animals and vegetables, to a man when asleep and awake, to the fœtus and the infant, to the organs of assimilating functions, and to those organs which put us on a level with surrounding beings. This low degree of sensation could not have been sufficient for the existence of man, and of beings resembling him exposed to numerous connexions with every thing that surrounds them; therefore they possess a sensibility far superior, by which impressions affecting certain organs are perceived, judged, compared, &c. This sort of sensibility would be more properly called perceptibility, or the faculty of judging of the motions experienced. It requires a centre to which the impressions have a mutual relation; therefore it only exists in animals which like man have a brain, or something equivalent in its place; whilst zoophites and vegetables, not possessing this central organ, are both destitute of this faculty; however polypi, and several plants, as the sensitive, have certain spontaneous motions, which seem to indicate the existence of volition, and consequently of perceptibility; but these actions, like that of a muscle from the thigh of a frog excited by the galvanic stimulus, are occasioned by an impression that does not extend beyond the part itself, and in which sensibility and contractility exist in a confused state.

Perhaps volition is the best test of these kinds of susceptibility; yet volition has some power over the organic functions, as in the instance of respiration; and the increase of sensibility on some occasions under disease adds to the difficulty of defining and separating it according to its grades. Richerand imputes our want of consciousness of impressions upon our organs by the animal fluids to our being accustomed to them, as is to be observed in vision, hearing, smell, taste, and feeling, which cease to be excited by stimuli to which they have been long accustomed. But, if this be the cause, surely the sensibility must have been intolerable before it began to operate: at the moment of birth it must have been beyond endurance. Is it not more probable that this want of consciousness proceeds from the nature of involuntary living action? Is not the sensibility in question an intermediate faculty between that which gives sensation and volition and that upon which muscular irritation and contraction depend? In a galvanised frog there can be no perception; for (as Cuvier observes) the possession of sensation by these fragments cannot be reconciled with our consciousness of the unity of our being, although the actions are excited through the medium of nervous susceptibility, and are of a different nature from those which would follow a mere irritation of the muscular fibre. May we not then infer that the nervous organisation is endowed with a susceptibility independent of what M. Richerand perhaps improperly calls percipient sensibility; and that it is through the medium of this faculty that the incessant and unperceived performance of the vital functions is accomplished? When the voluntary faculty ceases to acknowledge its appropriate stimuli; when sensation for a time is suspended, as in apoplexy, or in experiments on frogs by pouring opium on the brain of these animals; the vital functions are still kept going on by means of the susceptibility to which we now refer. Convulsive action, whether occurring in the voluntary or involuntary muscles, seems to result from an unhealthy condition of this nervous susceptibility, which, in instances of sudden death, produced by an abrupt abolition of the sentient and loco-motive faculty, for some time longer lingers in the system, deranged, indeed, but not yet destroyed, and produces those spasmodic motions which are observed in an animal body under the circumstances which we are now supposing. When, for example, a domestic fowl is deprived of life, either by its head being severed from its body, or by the more usual mode of screwing the neck, a spasmodic or convulsive kind of vellications will be observed, and indicate the remains of this susceptibility for some time subsequently to the departure of actual sensibility. In the case of articulated worms a like separation of parts does not seem to operate the same immediate destruction of the sensitive and locomotive faculty; for as, in them, there is no single brain, but ganglia as the centres of sensation and volition, each part of a divided worm is thus, as we have above remarked, a distinct sentient being. From the remains of this principle may originate those convulsive affections which almost invariably precede death in the course of nature, and which are often manifest in a violent degree for some time after the departure of the sentient or perceiving faculty; but which is itself destroyed prior to the total destruction of muscular irritability, or the vis insita of Haller. This last property is denominated by the moderns contractility, and is generally supposed to exist rather in the muscular than nervous tissues. The general organ, says Cuvier, of motion, is the fleshy or muscular fibre. This fibre contracts itself by volition, but the will only exercises this power through the medium of the nerves. Every fleshy fibre receives a nervous filament, and the obedience of the fibre ceases when the communication of that filament with the rest of the system is cut off or interrupted. Certain external agents applied immediately to the fibre likewise cause contractions, and they preserve their action upon it even after the section of its nerve, or its total separation from the body, during a period which is longer or shorter in different species of animals. This faculty of the fibre is called its irritability. Does it in the latter case, continues Cuvier, depend upon the portion of the nerve remaining in the fibre after its section which always forms an essential part of it? or is the influence of the will only a particular circumstance, and the effect of an irritating action of the nerve on a faculty inherent in the muscular fibre? Haller and his followers have adopted the latter opinion, but every day seems to add to the probability of the opposite theory.'

Those of course who follow this theory would conceive, as very many do conceive, that the nervous and muscular tissues are modifications of one simple structure, while the followers of Haller regard muscle and nerve as, ab origine ad finem, distinct organisation; and these last suppose that the nerves are mere instruments for developing contractility in the muscular fibre, which contractility is capable of being exhibited without the interposition of nerve at all. Many plants are possessed of contractile, though not as it would appear of sensitive, or proper sensitive, or loco-motive power; this contractility, from the mode of its excitation and from the phenomena which it exhibits, has been thought to be the same with the irritability of the animal fibre, although neither brain nor nerves have yet been detected in vegetables. In opposition, however, to the muscular doctrine, if so we may term it, some have questioned the existence of muscular fibre as a distinct tissue. M. Delametherorie, a French physiologist, who wrote some few years since, carries this principle or assumption to the extent of denying altogether muscular construction, and states that the substance which has been ordinarily considered muscle is merely a congeries of blood vessels, lymphatics, and nervous filaments, bound together by cellular membrane, in the intervals of which are deposited animal gelatine and fat, and many since his time have reasoned upon the same assumption.

Irritability itself, on the other hand, has been divided into two species: the one has been named by some physiologists tenacity, the other musculosity; but perhaps the difference would rather refer to the variation of susceptibility to excitant than any thing otherwise specific; the slow, gradual, and tonic, action of the bladder in expelling the urine, to which we may probably add the power which conveys the blood the round of circulation after it has lost the influence of the heart's action, seems principally to vary from that of the voluntary muscles by being more beyond the influence and caprices of the will.

Irritability and sensibility, whether distinct faculties or modifications of the same property, are developed and excited by peculiar and respective agents, even where the structural arrangement of parts would not point out any variation. Thus, light is a stimulus to the eye, sound to the ear, a sapid body to the taste, and an odoriferous body to the smell. Thus mercury will excite the hepatic foxglove, the renal viscus, although in each instance the indivisible faculties of sensibility or irritability are called into play; and no difference indicating peculiar excitability can be traced by the anatomist in the arrangement, or the chemist in the composition of the ultimate fibrillæ, constituting either the nerves or the contractile organs of the respective parts. This circumstance, as we shall afterwards see when treating of the circulation, is laid hold of as an argument in favor of the independent power of blood-vessels in the way of contractile propulsion, although their proper muscularity is denied by those who regard them as mere regulators of, not efficient organs in, the circulatory impulse.

The animal frame is thus altogether supported partly in the same manner as a piece of complicated machinery, composed of several springs, each of which is kept in exercise by a principle peculiar to itself, while the effect of them all together is one resulting whole; produced and maintained by one prime and constantly operating principle—the vitals.

Now researches into the nature, and essence, and cause of this principle have been characterised, even up to the present day, by a great deal of misconception as to the very nature and object of philosophising. One party, as we have remarked in another place, advocating the doctrine that organisation, or a certain mode of putting together the particles or molecules of which an organised substance is composed, is the principle upon which vitality is produced; while another contends that this vitality is a something—a subtile something—appended to matter, seemingly forgetful that such something, however subtile, must, to come within the cognizance of our ken, be itself matter; for man never has had, nor can have, any notion of the mode of that existence which is named spiritual in opposition to material. The opponents, then, of the organic theorists, are in reality more decidedly materialists than are those against which their arguments and invectives are directed; and although when the organist means to say that every thing connected with life, from the mere lowest grade of sentient manifestation up to the highest degree of intellectual and moral being, is the result of bodily construction, and that, therefore, the materials of which the body is composed are the ultimatum of every thing in thought and act; when, we say, the organologist reasons and infers from these premises, and in this manner, and to this end, his inferences are wide of the truth, and his principles most decidedly at variance with all that is seen and known respecting volition and responsibility. But we must contend that the appending philosopher, if so we may term him, makes the matter worse, and forgets that, even upon his own showing, he is giving immortality and perpetuity of existence to the meanest reptile that crawls upon the earth.

No one can question that life exhibits an order of truths peculiar to itself, and which is nowhere to be found beyond the sphere of living existence; but we should always recollect that it is the province of physical reasoning not to imagine, but to infer; and when we observe that this same life, in all its modifications and stages, requires for its development and maintenance the incessant agency of peculiar powers, and matter peculiarly constructed, we are not merely justified in concluding, but we are compelled to the inference, that the combinations of effects to which we have applied the term life are connected with such agency and such organised matter. The nature of the link which constitutes this connexion must ever in one sense be concealed—that is, the why and wherefore it is brought about;—but the connexion itself is sufficiently evident, and all our knowledge, after discoursing and disputing to the end of time, must terminate in the result of observations on the laws, not in finding out the essence, of vitality: a proposition this which one should think sufficiently plain and perspicuous, but if it had been received and properly acted upon would have saved the press the labor of volume upon volume of unmeaning controversy.

But to revert briefly to the subject of this introductory disquisition: We have first seen that there is considerable intricacy attached to the question respecting the material elements which enter into the composition of an organised body—that some have supposed the primordial elements to be globular—that some have opposed this assumption, and that much of ingenuity but nothing absolutely satisfactory has been shown by physiologists in their investigation of the elements of bodies. We have all along assumed that there is a great leading distinction between animate and, inanimate, or organised and dead matter, in the one depending for its totality of existence upon some central principle, while the other has a sort of independent being, one fragment of dead matter being the same in quality as the mass from which it has been broken. It has been remarked further that when we come to trace the differences in the degrees of this organising principle through vegetable and animal life, that we find difficulty in the distinction between mere susceptibility and positive sensibility; but that perceptibility and irritability, and volition, are clearly distinct powers or faculties, the difficulty lying principally in the necessity we are under often of assuming sensibility in a sort of latent form or without consciousness on the part of the individual in whom it is called into being.

On this last particular we may have a word or two more to say when we are upon the subject of the *sensations*; we now proceed to treat of the functions peculiar to life, and in so doing we shall follow generally the arrangement proposed and adopted by Richerand, which appears to us the most philosophical and satisfactory scheme that has been contrived. Here and there we shall deviate from the arrangement; but when we do so the reason for the change will we imagine be sufficiently obvious to the reader.

Classification of the functions of life.

Class I. Functions which serve for the preservation of the individual (individual life.)	Order 1st. Functions which assimilate the aliment by which the body is nourished (assimilating, internal, or digestive functions).	Genus 1st. *Digestion* extracts the nutritive part.	Reception of the food. Mastication. Solution by the saliva. Deglutition. Digestion in the stomach. duodenum. intestines. Excretion of the fœces and urine.
		Genus 2nd. *Absorption* carries it into the mass of humors.	Inhalation of chyle. lymph. Action of vessels. glands. the thoracic duct.
		Genus 3d. *Circulation* propels it towards the organs.	Action of the heart. arteries. capillary vessels. veins.
		Genus 4th. *Respiration* combines it with atmospheric oxygen?	Action of the parietes of the thorax. lungs. Alteration of the air. in the blood. Disengagement of animal heat.
		Genus 5th. *Secretion* causes it to pass through several modifications.	Exhalation. Secretion by follicles. glands.
		Genus 6th. *Nutrition* applies it to organs to which it is to supply growth and restore their loss.	Different in every part according to the peculiar composition of each.
	Order 2nd. Functions which form connexions with surrounding objects (*external* or *relative functions*).	Genus 1st. *Sensations* inform the being of their presence.	Organs of the sight. hearing. smell. taste. feeling. Action of nerves. the brain. Human understanding. Sleep and watching. Dreaming and sleep-walking. Sympathy. Habit.
		Genus 2nd. *Motions* approach towards or remove it from them.	Organs and muscular motion. The skeleton. Articulations. Place.
		Genus 3rd. The *voice* and *speech* cause it to communicate with similar beings without change of place.	Progressive motions: Walking. Running. Jumping. Swimming. Flying. Creeping. The voice: Articulated, or speech. Modulated, or singing. Stammering. Lisping. Dumbness. Ventriloquism.

Class II. Functions which serve for the preservation of the species (life of the species.)	Order 1st. Functions which require the concurrence of both sexes.	*Conception and generation.*	General differences of the sexes. Hermaphroditism. Systems relative to generation.
	Order 2nd. Functions which belong exclusively to females.	*Gestation.*	Of the uterus in a state of impregnation. History of the embryo fœtus and its membranes.
		Delivery.	Of the uterus after delivery. The lochiæ.
		Lactation.	Action of the breasts. Milk.
		Growth.	Infancy—dentition—ossification. Puberty—menstruation. Adolescence. Youth.
		Virility	Temperament. — Sanguine. Muscular. Biliary melancholic. Lymphatic. Nervous. Idiosyncracy. Human race. — European. Negro. Mongol. Hyperborean.
		Decrease.	Age of decrease. Old age. Decrepitude. Death. Putrefaction.

After piesenting his readers with the above table of classification, and giving his reasons for its adoption, M. Richerand goes on to observe very properly that too much importance should not be attached to it, being like all others purely hypothetical. All is connected together; all is co-ordinate in the animal economy; the functions are linked together and depend on one another, and are performed simultaneously; all represent a circle in which it is not possible to mark the beginning or the end. In circulum abeunt.—Hippocrates. In man, while awake, digestion, absorption, circulation, respiration, secretion, nutrition, sensation, motion, voice, and even generation, may be performed at the same time; but whoever, in the study of the animal economy, should bestow his attention on this simultaneous exertion of the functions, would acquire but a confused knowledge of them.

'I might,' adds our author in another part, 'have begun by a view of the external functions as well as those of assimilation or nutrition, of sensation or of digestion. I have given preference to the functions of assimilation because of all others they are the most essential to existence, and their exercise is never interrupted from the instant in which the embryo begins to live, till death. In beginning with an account of them we, therefore, imitate nature; who imparts to man this mode of existence before she has connected him with outward objects, and who does not deprive him of it until the organs of sense, of motion, and of the voice, have completely ceased to act.

As in one particular we shall deviate from our author's arrangement, viz., in considering the voice immediately after the respiratory function, it may not be amiss before we commence to let M. Richerand state in his own words his reason for separating these functions; which, although there is some degree of force in it, does not, we confess, appear to us sufficiently powerful to authorise the separation.

'As to the course,' says M. Richerand, 'which has been followed in the arrangement of the functions that belong to the same order, or which concur in the same end, it was too well laid down by nature to permit us to depart from it. I have thought it right that the consideration of the voice should immediately precede that of generation, in order that the arrangement might at a glance show the connexion that exists between their phenomena. Several animals use their voice only during the season of love; the birds which sing at all times have, during that period, a more powerful and sonorous voice. When man becomes capable of reproduction his vocal organs suddenly become evolved, as though nature had wished to inform him that it is through them he is to express his desires to the gentle being who may sympathise in them. The voice, therefore, serves as a natural connexion between the external functions and those which are employed in the preservation of the human species.

'The voice, which leads so naturally from the functions which establish our external relations to those whose end is the preservation of the species, is still more intimately connected with motion. It is, in a manner, the complement of the phenomena of loco-motion; by means of it our communication with external objects is rendered easier, more prompt, and more extensive; it depends on muscular action, and is the result of voluntary motion. Finally, these motions sometimes supply the place of speech, in pantomime for example, and in the greater number of cases the language of action concurs in adding to its effect. Every thing, therefore, justifies us in placing this function after motion, in separating it from respiration, with which every other has joined it, without considering that the relation between the voice and respiration is purely anatomical, and can, therefore, in no wise apply to physiology.'

Of Digestion.

Under this head it will be seen, by reference to the table, are included the reception of the food, mastication, solution by the saliva, deglutition, digestion in the stomach, in the duodenum, and in the intestines, and lastly, the excretion of the fœces and urine. This order then we shall pursue, and these several particulars we shall include while treating on the digestive process; and we shall have to speak of the pancreatic secretion, of the bile, of the spleen, and omentum as auxiliaries or subsidiaries to the function in question.

The food received by the mouth is masticated or ground down by the teeth, which are so constructed in man as to be equal to the tearing or grinding down of both vegetable and animal substances. The canine, or as Richerand calls them, laniary teeth, are for the purpose of dividing hard substances, and it is by these principally that man is proved to be naturally carnivorous; the cuspid serve for the biting off small pieces; while the molares or grinding are those by which the act of mastication is mainly performed, after the morsel has been torn off by the laniary teeth, and as it were cut through by the cuspid.

In this process of mastication the lower jaw is principally brought into action, which is so connected with the skull as to admit of easy motion, while the articulation is at the same time very strong; 'its condyles are prevented from descending very deeply into the glenoid cavity, and thus being confined to vertical movements, by a cartilage which is hollow on each surface, and moveable, and permit the condyle to move from the glenoid cavity to a tubercle which stands before this, and thus to acquire still greater mobility.' We find, however, in some instances of opening the mouth exceedingly wide, as in gaping or singing, that dislocation here occurs, though very rarely, the condyles slipping under the zygomatic arches.

Now during this movement of the lower jaw, and the manducation by the teeth, a flow of saliva is occasioned from the salivary glands, being mechanically and otherwise excited into action, and thus is the food further acted upon by this secretion, which during the process becomes mixed with mucus of the labial and buccal glands, and the moisture which comes from the soft parts of the mouth. The food thus prepared is pressed by the tongue against the roof of the mouth, which 'turning its tip upwards, and backwards, at the same time that its base is depressed, there is offered to the food an inclined plane, over which the tongue presses it from before backwards, to make it clear the isthmus of the fauces, and to thrust it into the œsophagus.' The following is the account which Blumenbach gives of the mechanism of deglutition:—'The tongue being drawn towards its root, swelling and growing rigid, receives the bolus of food upon its dorsum, which is drawn into a hollow form. The bolus is then rolled into the isthmus of the fauces, and caught with a curious and rather violent effort by the infundibulum of the pharynx, which is enlarged and in some measure drawn forward to receive it. The three constrictor muscles of the pharynx drive it into the œsophagus. These motions are all performed in very rapid succession, and require but a short space of time. Nature,' he goes on to say, 'has provided various contrivances for opening and securing this passage. The important motion of the tongue is regulated by the os hyoides. The smallest particle of food is prevented from entering the nostrils, or Eustathian tube, by means of the soft palate, which, as well as the uvula suspended from its arch, and whose use is not clearly understood, is extended by muscles of its own, and closes those openings. The tongue protects the glottis; for the larynx at the moment of deglutition is drawn upwards and forwards, and in a manner concealed under the retracted root of the tongue, and applied to the latter in such a way that the glottis, being also constricted and protected by the epiglottis, is most securely defended from the entrance of foreign substances.' We may remark, by the way, that there is some obscurity with reference to the epiglottis; for it seems that, as Dr. G. states in a note on Blumenbach, the glottis may be closed sufficiently, independently of the epiglottis. We have been informed that the celebrated tragedian Mr. John Kemble was without an epiglottis, and Dr. Magendie states that 'he saw two persons perfectly destitute of epiglottes, who always swallowed without difficulty.' Targioni also, we are told, met with one, and in that case neither deglutition nor speech was impaired.

Passing thus over the glottis, the food is received into the œsophagus, through which it is propelled into the stomach, not by its specific gravity, but by the contraction of this membrano-muscular canal; for although, as it has been observed, weight is no obstacle to the food passing through the œsophagus into the stomach, yet it has so little to do with it 'that the diminution of the muscular contractility at the approach of death is sufficient altogether to prevent it. The act of drinking is then attended with a noise of unfavorable omen. This noise consists in the gurgling of the fluid, which has a tendency to get into the larynx, whose opening is not covered over by the epiglottis; and if the attempt to swallow be persevered in, or if the by-standers insist upon getting some fluid down the throat, the deglutition of which is impracticable, it flows into the trachea, and the patient dies of suffocation.'

The mass thus prepared by manducation, and by the fluids to which we have referred, is now received into the stomach, and here it becomes subjected to the influence of a secretion, which seems to be constantly poured out from the inner surface of the organ, and which fluid is named the gastric juice, the nature of which, and the purposes it reserves in the digestive process, we are immediately to observe upon.

How, it may be asked, does this secretion apply itself to every portion of the injected material, since the fluid is only of course poured out from the membrane of the stomach itself, and unless it be supplied in sufficient quantity to penetrate the whole of the mass as it passes through the viscus, it might be expected that some, and indeed the greater portion of the ingesta would pass on to the outward, or pyloric extremity of the stomach, unaffected by the gastric secretion? But it has been shown, by the experiments of Dr. Wilson Philip, that the layer of the food next the surface of the stomach is first digested, and in proportion as this undergoes the proper change, and is moved on by the muscular action of the stomach, that next in turn succeeds to undergo the same change. 'There is something,' says Dr. Uwins in his recent Treatise on Stomach Affections, 'exceedingly interesting in the mode by which this successive application of portions of food to the surface of the stomach is effected. It is indeed brought about by virtue of that peculiar action which is called peristaltic, and which extends down the whole line of the intestines. When I first read Dr. Philip's remarks on this particular in his work on indigestion, I conceived them to be as novel as they are interesting, and I still believe Dr. P. to have been quite unconscious of having been anticipated; but, in looking over some old works on the subject of digestion, a friend of mine found a statement in a thesis bearing the date of 1715 which is almost verbatim the same with that of Dr. P.' We have consulted the treatise to which allusion is here made, and find, as it is stated, that Dr. Philip's account of the process is almost a translation of the Latin. But Dr. P. was doubtless ignorant of this curious anticipation of his very interesting discovery.

Blumenbach expresses himself in the following manner, in reference to the rationale of digestion. 'This very important function is probably assisted by various accessory circumstances. Among them some particularly mention the peristaltic motion, which, being constant and undulatory, agitates and subdues the pultaceous mass of food. The existence of a true peristaltic motion in the stomach during health is not however quite certain: indeed the undulatory agitation of the stomach that occurs appears intended for the purpose of driving the thoroughly dissolved portion downwards [onwards], while those portions which are not completely subacted are repelled from the pylorus by an anti-peristaltic motion.' So that here we have in some measure an announcement of the same principle as that of Dr. P., but to this last individual the credit is undoubtedly due of establishing, by a series of well conducted experiments, the precise mode in which the part of the food acted on by the gastric juice is pushed on towards the pylorus, and other portions take its place to be treated in the same manner. It is said that during healthy digestion the chyme passes the pylorus in between three and six hours after meals.

Having passed this orifice of the stomach it has now arrived at the duodenum, and it may be right to state that there is a peculiarity in the construction, position, and office of this the first of the intestines, which together constitute it a sort of second stomach; it is in the first place more fixed in its place than the other portions of the intestinal tube, and here too the chyme is acted on not only by the secretions from the internal surface of the gut, but by the bile and pancreatic fluid, both of which are received into the duodenum.

From the duodenum the mass is continued along the course of the small intestines by a true peristaltic impulse, by which a sort of vermicular motion is occasioned, and through which the gradual propulsion is effected. At the commencement of the large intestines the reader conversant with anatomy knows that there is such a construction of the canal as to facilitate a third detention of the mass, and to prevent any return of it into the smaller intestines; here it is that the fæcal character commences upon the ingesta, for the food by this time has lost a great deal of its nutritious portion, and it is the office of the large intestines to receive and separate and expel this excrementitious portion. And, whatever disarrangement may take place in the stomach or bowels, no fæcal matter can be returned into the upper division of the intestinal canal, unless the valve at the ideal head of the colon have lost its muscular power.

Such then is briefly the digestive organisation. We have first the mouth for the reception of the food, the teeth and motion of the jaws for manducation, the salivary secretion, and the curious construction of the pharynx and glottis for propelling the mass into the stomach. We have next the stomach for subjecting the mass to the agency of the gastric juice. We have thirdly its passage into the duodenum, its further retention there, and the reception into this gut of the biliary and pancreatic secretion. The mass from the duodenum is propelled slowly on by peristaltic action through the convolutions of the jejunum and ileum, and from the inner surface of these last it is that those innumerable chyliferous vessels take up the nutritious portion of the food and convey it into the blood, while the effete part passes on through the valve of the colon; here it becomes more thoroughly excrementitious, and is at length, still by the peristaltic or vermicular motion of the gut, transmitted to the rectum to be discharged by the anus, when the sphincter or retaining power of that gut is solicited to give way by the quantity or stimulus of the contained fæces.

But it behoves us to stop and enquire a little further into the nature of the respective changes produced upon the aliment in the mouth, in the stomach, in the duodenum, and its passage through the intestinal convolutions.

That saliva in the first instance operates a considerable change upon the masticated mass is sufficiently evident, and it is curious to observe that the very action which communicates the food excites to the secretion of the salivary glands. Here then the first change is effected, but of its precise nature we want perhaps further observation and experiment to satisfy us.

For the chemical composition of the saliva the reader is referred to the article CHEMISTRY; it may be here just stated that it has a strong affinity for oxygen, and it has been suggested that an absorption of that principle takes place during mastication, so as to assist in the changes which the alimentary mass is destined to undergo. It has, however, been justly remarked that the absorption of oxygen by this fluid, during the process of mastication, has not been sufficiently attended to in our speculations respecting the process of digestion. We can hardly suppose that it takes up oxygen without a portion of nitrogen or common air; and if any quantity of the latter be mixed with it during the insalivation of the food an evident source is disclosed, from which nitrogen may be conveyed into the circulating fluids in addition to that which is derived from the ordinary aliments. The importance then of the salivary secretion in aid of the digestive process is easily conceivable; and, although pathological and practical intimations are somewhat out of place in a treatise on pathology, we may just stop to say that due mastication of the food is not merely of consequence from the division of its parts into small fragments, but that it is also important inasmuch as it gives time and opportunity for the admixture of the saliva with the communicated mass; and that therefore persons who are in the practice of fast eating deprive their stomachs of one of the assistants which nature has provided.

But what is the absolute nature of the influence which the gastric juice effects upon the ingested material? It was once supposed that a species of fermentation constituted the principle of the digestive action; trituration also was conjectured especially by the mechanical physiologists to operate the effect; and to such an extent was this assumption carried that Dr. Pitcairn suggested the food to be ground down with a pressure equal to the weight of not less than 170,000 lbs., assisted at the same time in its gigantic labor by an equal pressure derived from the surrounding muscles. Maceration, putrefaction, concoction, have all at different times been proposed as principles of the digestive process, but all in the most vague manner, and without a due recognition of the fact that what takes place under the guidance of vitality does not require or admit of analogies from other departments of nature in an abstract manner. John Hunter used to settle this matter in a laconic but satisfactory way: 'The stomach, gentlemen,' he was wont to say while addressing his pupils, 'has been held by some to be a mill, others will have that it is a fermenting vat, others that it is a stew-pan; but in my view of the matter it is neither a mill, a fermenting vat, nor a stew-pan, but a stomach, gentlemen, a stomach.'

It is now pretty generally allowed that the conversion of food into chyme (the name given to the pulpy mass which is projected into the duodenum) is principally effected by the solvent and coagulating power of the gastric secretion; but even this solvent energy is of a sui generis character, and does not admit of close comparison with solution effected out of the body. The coagulating quality of the secretion is evinced by its effecting this change upon milk that is taken into the stomach; but this coagulated mass is soon redissolved and commingled with the other portions of the chyme. The solvent power indeed of the gastric secretion is so great, that under some circumstances the coats of the stomach have been corroded by it. It was the opinion of Mr. John Hunter, however, that such a fact can never take place except in cases of sudden death, when the stomach is in full health and the gastric secretion now just poured forth is surrounded by a dead organ; for he argues plausibly that, so long as the stomach is itself alive, it is capable by its living principle of counteracting the effect of this solvent power, a power so great that handles of clasped knives have been found half digested, and their blades blunted in the stomach, and pieces of the toughest meats and of the hardest bones enclosed by Dr. Stevens in perforated balls, and thus necessarily uninfluenced by any action of the stomach itself, were eventually broken down and dissolved by the contact of the gastric secretion.

It is generally allowed that besides this solvent and peculiar agency of the gastric secretion itself, digestion or conversion into chyme of the ingested mass is assisted by pressure on the stomach from the alternate motion of the abdomen, and the high temperature of the parts. We all know how material an aid to the digestive functions exercise proves, and this could not be the case were the conversion of the food into chyme merely consequent upon the solvent agency of the gastric fluid, unless indeed we might suppose that the exercise influenced by increasing this secretion, and thus only in an indirect manner contributing to the effect. While exercise thus contributes to the digestive process when taken at proper times and in due degrees, we must recollect that rest and certain positions on the other hand favor the due conversion of the food into chyme. If a person makes violent exertions, or takes a recumbent position immediately upon eating, digestion does not go on with so much ease as if he refrain from exercise and sit in an upright or only in an inclined posture. M. Richerand, in remarking on the observation that during sleep digestion takes place much more readily when we lie on the right than on the left side, states that this has been ascribed to the compression of the liver on the stomach, but that it is much more likely to depend on the circumstance that when we lie on the right side the passage of the food is facilitated by its own weight, the natural obliquity of the stomach from left to right being increased by the changes attending the presence of the food.

But there are questions that still remain to be answered in reference to the gastric fluid, as a digestive agent, viz.:—What is the quantity in a given time of this secretion which is poured out from the secretory surface of the stomach? what is its precise chemical nature or quality? and whether, after it has operated in the formation of chyme, that chyme is always of the same nature?

In respect, however, both to the quantity and precise quality of the gastric juice, there is some difficulty, since it is next to impossible to procure it entirely unmixed with the other secretions which are poured out from the stomach simultaneously; and then again it is supposed that it varies in different stomachs, or even in the same stomach at different times. Magendie remarks, that the application of different substances to the surface which secretes it constantly modifies its nature; and 'it is at least certain,' says Dr. Paris, in his Treatise on Diet, 'that the gastric juice varies in different animals: for example, that of man is incapable of acting (readily) on bones, while that of a dog digests those substances perfectly.' It has, however, been conjectured that the average quantity secreted is about a pound in twenty-four hours; and Dr. Good remarks in the following way as to its quality:—'It is a thin, transparent, and uninflammable fluid, of a weak saline taste and destitute of smell.' Generally speaking, it has a near resemblance in its external properties to the saliva, and is neither acid nor alkaline; though in these qualities it seems to vary more or less not only in animals, whose digestive organs are of a different structure from those of man, but even in the same animal under different circumstances. It may, however, be laid down as a regular rule that in carnivorous and graminivorous animals, possessing only a single stomach, this fluid is slightly acid, and colors blue vegetable juices red. In omnivorous animals, as man, whose food is composed of vegetable and animal materials indifferently, it is neutral; and in graminivorous ruminating animals with four stomachs, and particularly in the adults of these kinds, it is slightly alkaline, and colors blue vegetable juices green.

Dr. Prout, and some of the continental chemists, have contended for the generation in the gastric juice of muriatic acid, both free and combined with alkalis. Leudet and Lassaign have lately instituted experiments which in some measure contradict those of Prout, Tiedemam, and Gmelin, so that the subject may be considered in some measure still sub judice.

We will just make room for the insertion of the following extract from Dr. Elliotson on the subject of the digestive organisation and functions in other animals beside man.

In granivorous birds the food passes into the crop, and from this into a second cavity, from which it enters the gizzard, a strong muscular receptacle, lined by a thick membrane, in which, instead of been masticated, it is ground down by means of pebbles and other hard bodies swallowed instinctively by the animal; hence true salivary glands do not exist about the mouth of birds, but abound in the abdomen opening into the lower part of the crop and the gizzard. In carnivorous birds, the gizzard is soft and smooth. The fluids of both crop and gizzard contain a free acid, according to Tiedmann and Gmelin, which is the muriatic or acetic.

Some graminivorous quadrupeds, with divided hoofs, have four stomachs, into the first of which food passes when swallowed, and from this into the second. It is subsequently returned by portions into the stomach, chewed, and again swallowed, when, by a contraction of the openings of the two first stomachs, it passes over them into the third, and from this goes into the fourth. The process can be delayed at pleasure when the paunch is quite full. Some birds and insects also ruminate. The same chemists found the fluids of the two first stomachs alkaline, and of the third and fourth acid. The stomachs of some insects and crustacea contain teeth. Some zoophytes are little more than a stomach; others have several openings on the surface leading by canals that unite and run into the stomach—a structure, called by Cuvier mouth-root. Between the most distinct kinds of stomach we see numerous intermediate varieties. The cardiac half of the interior of the stomach of a horse for example, is covered by cuticle, and appears merely recipient, while the pyloric half is villous and digestive, and the state of the contents in each half is therefore very different, a link thus existing between such stomachs as the human and the ruminating.'

And with respect to our last question propounded above, viz. whether chyle be the same whatever aliment it may be manufactured from? Magendie and others have proved that it is not, but that there are as many species of chyme as there are food; and even this difference continues to exist in dung in a considerable measure after the duodenal action, and the biliary and pancreatic secretion have together operated the further change so as to have converted the chyme into chyle; for, according to the experiments of the ablest physiologists, this last fluid differs in composition, according to the nature of the ingesta from which it has been formed. When the individual, for instance, has been chiefly sustained by sugar, the chyle is without that mixture of fibrine which is found when the food has been principally composed of animal matter; and when much oil or fat has entered into the constituents of the aliment, the chyle differs both in appearance and odor from that under common circumstances—it is more acrimonious or alkalescent.

Magendie, we may take occasion here to remark, concluded by a series of experiments that no animal is capable of deriving nutriment from any material that does not contain some portion of nitrogen or azote; for, on feeding animals of various kinds on substances without a sensible portion of this principle, such as sugar, gum, olive oil, and butter, together with distilled water, and limiting them to this diet, they gradually lost flesh and strength, and at length died; and it proved a singular circumstance in these experiments that all the animals, before death, exhibited an ulcer in the cornea, which sometimes so spread as to empty the eye of its humors.

But we are now to consider the duodenal and other changes which the chyme undergoes. It has already been said that when the mass enters into this gut (the duodenum) it becomes mixed with the secretions poured into this organ from the pancreas, the liver, and the duodenum itself: here then it becomes chyle; or the duodenum may be considered, as we have above intimated, a second stomach. Now let us enquire what part the bile, what the pancreatic secretion, what the spleen, and what the omentum may be considered as contributing to this conversion of chyme into chyle.

It is a curious fact that there is considerable similarity in the nature of the pancreatic secretion and that from the salivary glands; and that there is a sympathy between the secretory organs of the one fluid and the other, so that what excites the salivary secretion excites simultaneously the pancreatic; and it should seem that what the saliva does for the mass in the mouth, the pancreatic juice does for the chyme in the duodenum. It is also observable that the pancreatic fluid is in larger quantities in herbivorous than in carnivorous animals; and, upon the whole, it seems fair to infer, with some physiologists of the present day, that it 'animalises the unazotised principles of vegetable food.' It is easy to conceive that there are greater impediments in the way of ascertaining the average quantity of this secretion than that of the saliva or the gastric juice itself.

The questions of interest in reference to the bile are—whence does it proceed? or in what manner is it secreted? and how far is it necessary for the completion of the chyliferous change?

'It has been disputed whether the bile is produced from arterial or venous blood. Although the former opinion is countenanced by the analogy of other secretions (see the section on *Secretion*), nevertheless more accurate investigation proves that the greater part, if not the whole, of the biliary secretion is venous. With respect to arguments derived from analogy, the vena portæ, resembling arteries in its distribution, may likewise bear a resemblance to them in function. Besides, the liver is analogous to the lungs, in which the great pulmonary vessels are intended for their function, and the bronchial arteries for their nourishment; and, if we are not greatly mistaken, the use of the hepatic artery is similar. We would, however, by no means completely deny its importance in the secretion of bile, but must regard it as inconsiderable, adventitious, and not well established.' So writes Blumenbach; and Dr. Elliotson, in commenting on this passage, remarks, that two instances have occurred in London of the vena portæ running, not to the liver, but immediately into the vena cava inferior. The bile must have been secreted entirely from the blood of the hepatic artery. One of these is described by Mr. Abernethy, and the other is mentioned by Mr. Lawrence. We must not forget, Dr. E. adds, that in the mollusca there is no vena portæ, and the liver secretes its blood from the aorta. M. Simon informs us that, after tying the hepatic artery in pigeons, the bile was secreted as usual; but after tying the vena portæ none was produced. Akaau found water injected into either the vena portæ or the hepatic artery exude on the surface of the liver, but this might be mere imbibition.

Upon the whole it seems a fair inference that the vena portæ is destined for the formation of bile principally but perhaps not wholly, and in cases of lusus naturæ the hepatic artery is called upon to supply its place; but it would be an interesting trial, to find whether bile, when thus secreted from the hepatic artery, is the same in chemical composition or absolute essence as when furnished by the vena portæ.

After the bile is secreted it is conveyed through its appropriate conduits into the duodenum; but even here there is a question, both with respect to the quantity of supply and whether the retention of it in the gall-bladder is necessary to the full saturation of its specific quality.

It has been observed by Bichat, Blumenbach, Douglass, and others, that cystic bile becomes more concentrated, viscid, and bitter, by stagnating in the gall bladder, the cause of which may be the absorption of its aqueous portions by the lymphatics; or by something positively added in this viscus; and although some animals are without a gall bladder, and although this viscus is absent in some rare cases in our own species, yet as a general circumstance it may be remarked, that in the carnivorous animals its existence seems far more general than among vegetable feeders. Now, as the carnivori are for the most part animals which can bear longer intervals of fasting than the herbivorous race, the gall bladder has been conjectured, by Cuvier, to be a reservoir of bile in cases where the animal is subject to lengthened periods of fasting from irregular or deficient supply of food. It may then have reference both to quantity and quality, or serve as well the purpose of a reservoir as an elaborator.

It is worthy of notice that the supply of bile is regulated by circumstances which create its demand. 'I attended a case,' says Dr. Monro, 'in which there was an abscess of the liver, and a preternatural communication between that organ and the lungs, through which the bile was secreted, and discharged by coughing. The quantity thus discharged was very different at different times. It was always greater after meals, and especially for an hour after dinner.' As a certain measure then, but not the same quantity, of bile may always be required, the gall bladder may serve to retain it for those occasions when the stimulus of eating is absent. But on these heads we have not much more than conjectural inference.

Whether the bile in the general way, and without the interference of disordered action, makes its way at all into the stomach has been a subject of enquiry. To us it would appear that bile getting into the stomach in any measure, or in any way, would imply disease; for had nature required this fluid for the formation of chyme it would most probably have been contrived that the ducts from the liver would have passed directly into some part of the stomach, and it should seem that all return through the pylorus into the stomach is contrary to the obvious construction of the pyloric valve, which is manifestly formed for the passage of matter only in one direction. Richerand, however, supposes that some portion of the bile always finds its way into the stomach, while Blumenbach and others are of a contrary opinion. After speaking of the uses of the fluid, the last mentioned author remarks: 'We shall omit the less probable uses assigned to the bile, v. g. of exciting hunger by regurgitating into the stomach—a circumstance which, we think, can hardly happen during health.'

The uses of the bile, in Blumenbach's opinion, are, that 'it gradually precipitates the fæces and separates the milky chyle from the mixed and equable pultaceous chyme, while this is passing through the tract of the small intestines after being propelled from the stomach into the duodenum, and diluted by the pancreatic juice. It separates itself,' he continues, 'into two portions, the one serous, the other resinous. The latter combines with the fæces, tinges them, and is discharged with them; the former is probably mixed with the chyle and carried back into the blood. The bile seems to act, moreover, as a stimulus to the peristaltic motion of the intestines.'

It is supposed by Dr. Prout, 'that during the precipitation of the chyle, and the decomposition of the bile, a gaseous product is usually evolved, the mass becomes neutral, and traces of an albuminous principle commence, strongest at a certain distance from the pylorus, below the point at which the bile enters the intestines; and gradually fainter in each direction. On mixing with chyme out of the body, a distinct precipitation takes place, and the mixture becomes neutral; but the formation of an albuminous principle is doubtful probably from the want of the pancreatic fluid. The bitter and bilious matter passes off with the fæces, while the soda of the bile probably combines with the acid, and contributes to the formation of chyle. The loss of the alkali, which preserves the picromel in solution, causes the separation of the latter; and Dr. Prout found the distinctive qualities of it the more evident the further from the intestine it was examined.

We continue our extract from Dr. Elliotson, who goes on to say: 'It is no longer wonderful that in jaundice it is so intense that no bile is seen in the fæces; and, according to Dr. Fordyce, even in artificial obstruction of the choledochus by ligature, nutrition continues, though no doubt less perfectly than in health. For Tiedemann and Gmelin after tying the biliary duct, which proved on dissection to have continued impervious, found the thoracic duct still containing an abundance of matter, yellowish, indeed, from the jaundice, but coagulating, and its coagulum becoming red, precisely like chyle; the small intestines had the soft flakes usually considered chyle, but thought mucus by them; and both large and small intestines contained nearly all the principles, except those of the bile, seen in sound animals; but the contents of the large intestines were exceedingly offensive. In the less satisfactory experiments of MM. Leuret and Lapaigne, the thoracic duct was still full of chyle.'

The conclusion from these experiments and observations would therefore appear to be, that, although the bile thus materially aids in separating the chyle from the other portions of the duodenal contents, the chyle *may* be formed without it, but probably in much inferior quantity, and in a state of much less perfection.

With these inferences the experiments and observations of Dr. Blundell and Mr. Brodie will be found to harmonise, both of whom, and Dr. B. in the first instance, tied the choledic duct for the purpose of ascertaining how far the process of nutrition, and the formation of chyle, were dependent upon the supply of bile from the liver to the duodenum.

'When an animal,' says Mr. Brodie, 'swallows solid food, the first change which it undergoes is that of solution in the stomach. In this state of solution it is denominated chyme. The appearance of the chyme varies according to the nature of the food. For example, in the stomach of a cat the lean or muscular part of animal food is converted into a brown fluid of the consistence of thin cream; while milk is first separated into its two constituent parts of coagulum and whey, the former of which is afterwards redissolved, and the whole converted into a fluid substance with very minute portions of coagulum floating in it. Under ordinary circumstances the chyme, as soon as it has entered the duodenum, assumes the character of chyle. The latter is seen mixed with excrementitious matter in the intestine; and, in its pure state, ascending the lacteal vessels. Nothing like chyle is ever found in the stomach; and Dr. Prout, whose attention has been much directed to the chemical examination of these fluids, has ascertained that albumen, which is the principal component part of chyle, is never to be discovered higher than the pylorus. Now, in my experiments, which were made chiefly on young cats, where a ligature had been applied so as to obstruct the choledic duct, the first of these processes, namely the production of chyme in the stomach, took place as usual; but the second, namely the conversion of chyme into chyle, was invariably and completely interrupted. Not the smallest trace of chyle was discoverable either in the intestines or the lacteals. The former contained a semi-fluid substance, resembling the chyme found in the stomach, with this difference, however, that it became of a thicker consistence in proportion as it was a greater distance from the stomach; and that, as it approached the termination of the ileum in the odeum, the fluid part of it had altogether disappeared, and there remained only a solid substance, differing in appearance from ordinary feces. The lacteals contained a transparent fluid, which I suppose to have consisted partly of lymph, partly of the more fluid part of the chyme, which had become absorbed.

'I conceive,' continues Mr. Brodie, 'that these experiments are sufficient to prove that the office of the bile is to change the nutritious part of the chyme into chyle, and to separate from it the excrementitious matter. An observation will here occur to the physiologist. If the bile be of so much importance in the animal economy, how is it that persons occasionally live for a considerable time in whom the flow of bile into the duodenum is interrupted? On this point it may be remarked, 1st. That it seldom happens that the obstruction of the choledic duct from disease is so complete as to prevent the passage of the bile altogether; and the circumstance of the evacuation being of a white color may prove the deficiency, but does not prove the total absence of bile. 2dly, That in the very few authenticated cases which have occurred of total obliteration of the choledic duct in the human subject, there has been, I believe, always extreme emaciation, showing that the function of nutrition was not properly performed. 3dly, That the fact of individuals having occasionally lived for a few weeks or months under these circumstances, only proves that nutrition may take place to some extent without chyle being formed. In my experiments I found that the more fluid parts of the chyme had been absorbed, and probably this would have been sufficient to maintain life during a limited period of time.'

It seems then, upon the whole, sufficiently evident that the fluid secreted by the liver, and transmitted into the duodenum, has a very considerable influence towards completing the process of chyle formation; there are some other notions respecting the office of this great viscus in the animal economy which are probably somewhat more hypothetical, but yet do not seem destitute of foundation, we mean that, like the lungs, it helps to rid the system of carbon. It is to be recollected that it is only to these two viscera, the lungs and the liver, that venous blood, blood charged with carbon, is transmitted; and it is matter of common observation that bilious diseases are most frequent in hot climates and seasons, which is attributed to the greater abundance of the bile in those times and circumstances, when less carbon passes off by the lungs, there not being so much occasion for the absorption of heat into the frame. Conformably to this theory it has been remarked, that 'in the fœtus, for whose temperature the mother's heat must be sufficient, the lungs perform no function, but the liver is of great size, and bile is secreted abundantly, so that the meconium accumulates considerably during the latter months of pregnancy. We shall see, indeed, that at the very time the functions of the lungs suddenly begin at birth, the liver suddenly loses so much of its supply of blood. Warm-blooded animals with large lungs, living in the air, have the liver proportionably smaller than those which live partly in water; in cold-blooded animals and reptiles, which have lungs with large cells, as but slightly to decarbonise the blood; in fish, which get rid of carbon but slowly by the gills; and in the molucca, which decarbonise still more slowly by gills or lungs, the liver is proportionally large. More blood flows to the liver accordingly as the lungs are less active organs. In the mammalia and birds it receives the blood of only the stomach, intestines, spleen, and pancreas; but, in the cold-blooded, of many other parts; in the tortoise of the hind legs, pelvis, tail, and vena azygos; in serpents of the right renal, and all the intercostal veins; in fish of the renal veins, the tail, and genitals. It is moreover said that in pneumonia and phthisis more bile is secreted; and in the *blue disease*, and other affections of the heart, that the liver is enlarged. The constituents of the bile contain a large quantity of carbon, which is chiefly in union with hydrogen, and under the form of resin or fatty matter, and resin is most abundant in the bile of herbivorous animals, whose food contains a very large proportion of carbon and hydrogen. In the lungs the carbon may be said to be burnt, whence animal heat; in the abdomen it passes off still combustible.'

Of the use of the spleen.—This still continues to be a physiological problem. That a large viscus should be found without any obvious intention seems extraordinary, and Dr. Paley, when he is treating on final causes, suggests 'that it may be merely a stuffing, a soft cushion to fill up a vacuum or hollow, which, unless occupied, would leave the package loose and unsteady;' thus supposing, as Dr. Elliotson wittily and sarcastically states it, that a pad is necessary to make the viscera fit, just as hatters put stuffing under the leather of a hat which is made too big for the head. 'When,' he adds, 'I consider the stupendous power and design displayed throughout nature, I instantly revolt at such an explanation as Paley's, to say nothing of its anatomical absurdity.'

The most generally entertained opinion of the office of this viscus is that it proves subservient to the stomach and liver, by collecting blood for the purpose of being sent to these last organs when a more than ordinary supply is required; and this inference has been drawn from the mode in which the blood-vessels of the spleen are connected with those of the liver and stomach; this last organ, when it is full, not only compressing the spleen by its distension, but, from the very same pressure, causing a diversion of blood from the spleen to itself. Mr. Pring, we believe, in a work of great originality, was the first to combat this supposition, and to maintain that we have no proof that the repletion of the stomach effects any material compression on the spleen and its blood-vessels, so as to alter the circulation. 'Besides, in ruminating animals, as Blumenbach observes, it lies next the first stomach or paunch, and, if compressed, must be so before digestion begins; and in proportion as the fourth stomach fills, and digestion proceeds more actively, is the distension of the paunch diminished.'

Sir Everard Home conceived that a great proportion of the liquid which disappears from the stomach might get from the cardiac extremity of this organ into the spleen, and thence into the mass of blood; but from later experiments he has been induced to abandon this hypothesis, and the real office of the spleen still continues among the arcana of nature. It is, however, most probably connected in some way with the digestive and assimilating functions, and it is a remarkable fact, long ago observed, that the extirpation of this organ sometimes renders the bile in the gall bladder pale and inert. Some physiologists have recently speculated on the use of the spleen in the lymphatic system; and still more recently it has been thought a secretory organ with a glandular duct, but nothing very satisfactory has been elicited from these views of the subject, and we repeat that more facts are wanting than hitherto we are in possession of to render fully evident the precise use of this viscus in the animal economy.

The *omentum* would seem principally ordained for the purpose of lubricating the intestines, and assisting their constant motion; but it has been suggested that this also as well as the spleen may serve as a diverticulum to the viscera; 'if,' says Blumenbach, 'we reflect on the singular structure of the omentum parvum or hepatogastrum especially, we may be inclined to believe that there is another, and perhaps principal office attached to it unknown at present, and discoverable by comparative anatomy.'

Respecting the functions of the large intestines we cannot do better perhaps than present to our readers the following extract from Dr. Capland.

'To the functions of the larger intestines may be given the term fæcation, because it is in this situation of the digestive canal that the fæcal matter is found. In its course through the small intestines the alimentary matters are deprived of their chyle, and of a portion of their aqueous parts; the residue is poured into the colon, where its course is more slow, and where it assumes new characters. The fæcal mass, according to the properties which it presents at the commencement of the colon, is evidently composed—1st. Of the residue of the aliments; and 2d. Of the excrementitial parts of the secretions poured into the superior parts of the digestive tube. The fæces, when they arrive in the rectum, or at the time of their expulsion from the body, are greatly increased by the more solid parts of the secretions poured out upon the internal surface of the colon, their more fluid parts having been absorbed. It is in some measure owing to the quantity and properties of the excrementitial parts of these latter secretions, which principally proceed from the follicular apparatus of this intestine, that the fæces present distinctive characters.'

Gaseous substances generally are found in greater or less abundance in the small intestines. This gas may come from more than one source; it may arise from the change which the alimentary substances undergo in their course, or it may be secreted by the mucous membrane of the intestines themselves. While we would not altogether deny a share in its production to the former, we contend for the latter. We believe that the mucous membrane of the digestive canal may both secrete gaseous substances and absorb them; and we found our belief upon the following circumstances:—1st. We have proofs, derived from experiment and observation, that gaseous substances are absorbed and given off from the mucous membranes of the respiratory apparatus. 2d. Pathological facts intimately connected with the functions and properties of this membrane, in different parts of the body, support the position. We have, however, no doubt that the changes which the alimentary substances undergo in the stomach occasional y give rise to gaseous products, and we believe that a similar result follows the removal of the excrementitial matters in the colon and rectum.

On the urinary secretion, which the reader will perceive by turning to the table of arrangement Richerand introduces under the head of digestion, we shall have to offer a few remarks when considering the subject of secretion; at present we shall limit ourselves to remarking that the transmission of fluids from the stomach to the urinary organs, and other parts, is a physiological problem that has not been satisfactorily solved.

Of Assimilation and Absorption.

Assimilation and absorption are the processes by which that remarkable characteristic of organic being, upon which we have commented in the introductory part of the present treatise, is effected and maintained. Our author says that a definition of life might be taken from the singular property which is possessed by a living being of preserving an independence of interior temperature through all the chances and changes of exterior heat; but, besides that this principle and law of living matter is subject to much qualification, it appears to us that life is still better distinguished from inorganic matter by the faculty which it possesses of making dead matter subservient to its own purposes, of attaching it to itself, and occasioning it to become an integral portion of the organised frame.

In respect, however, to the absolute nature and modus operandi of this faculty there is still much of doubt and dispute. Some supposing that the repairing function is exercised through a distinct order of vessels, the lacteals and lymphatics, for which see Anatomy. Others conceiving that matters are taken up both from without and from internal parts by the blood vessels, more especially the veins; from internal parts we say, for we shall afterwards see, when on the subject of exhalation and secretion, that there is a constant expulsion from the blood of matter, part of which is thrown out of the frame entirely, and part reabsorbed, or again taken up into the circulating mass.

In the section just concluded on digestion, we talked of chyle, and its separations from the effete part of the alimentary mass; but we did not pursue this same chyle on to its ultimate destination, which is that of the blood vessels through the lacteal vessels, opening in the villi of the intestines—the small intestines mainly—and running on into the receptacle of the chyle, to be conveyed by the thoracic duct into the blood vessels at the angle, found by the union of the subilavian and jugular vein.

Now no one doubts that these lacteal vessels are the main instruments through which nutritious matter is conveyed into the blood, and by which nutrition is thus mainly effected; but there are disputes still existing whether their office is actually limited to this function, and whether the other portion of vessels which with the lacteal have been, since the discovery of both of them, considered the vessels appropriated alone to the process of absorption, are in reality such; or whether the old supposition of imbibition or penetration through the coats of the veins of matter from without, the vessels must not be received to enable us to account for all the phenomena attendant upon absorption. Another point of uncertainty, in reference to the function now under notice, is this, whether any matter is taken up from the outer surface and conveyed into the blood-vessels, while the external skin or cuticle remains as an entire covering to that surface. In other words does the surface of the body absorb? It behoves us then in the present section not only to enquire into the rationale of assimilation and absorption, but to advert to these disputed particulars.

In respect to the lacteals and their office, there is something very singular in the selecting power which they manifest; for, although the chyle is applied to their mouths mixed with other matter, that other matter is rejected by them, and the chyle alone selected. This power indeed is manifested throughout the system of absorbents generally, some substances being chosen, and some left as unfit for reception. Every one has seen marks on the skin of sailors and others, which have been artificially made by pricking holes in the cuticle, and then rubbing into these holes charcoal or gunpowder; and these marks thus made remain permanent, because the absorbent power refuses to take the materials with which they are made into the mass of circulation. Indeed we might give another explanation of this phenomenon, viz. that fluidity being a necessary circumstance for absorption, these substances are not absorbed because they are not soluble in the fluids of the body. But a selecting principle is manifestly in operation throughout the whole absorbing system; and Magendie has contended for this principle, in the lacteals being carried to such an extent, as that they can be made to absorb nothing but chyle; a doctrine, however, which seems disproved by the well known experiments of Mr. John Hunter, who, pouring milk into the intestines of a dog, found the lacteals soon after filled with it. Different matters too will be taken up by the lacteals, carried through the circulation, and afterwards thrown out by emunctories; although, with respect to the extent and nature of this principle, there are confessedly some reasons to be doubtful.

What is the rationale, it is natural to enquire, of the process by which chyle is received into the minute branches of the lacteals, and conveyed on to the blood? That open mouths are exercised in this case at least, and that chyle does not penetrate the coats of the absorbent, has been demonstrated; so that, whatever may be the laws of absorption in other parts of the frame, in this there is not merely a selecting but an imbibing power displayed, and the chyle once received is as it were sucked through the vessels by a vital force, more similar than any other to that of capillary attraction in inanimate nature; but still different: or at least if there be an actual similarity in the mode of drawing up liquids through minute tubes, and the transmission of the chyle through the minute lacteals there is in the latter case a regulating force which must considerably modify the result; and, although it is right to call in the aid of natural philosophy for the explication of living actions, the mistakes which our ancestors have been led into from too largely admitted analogies ought always to be in recollection.

On the mesentery there are numerous glands attached to the lymphatic vessels, and which are so situated that the chyle, in passing on to the blood, traverses them; it is of course natural to suppose that some operation is performed by these glands upon the chyle: a supposition which is strengthened by the fact that although under some forms of disease, as in the mesenteric atrophy of children, the glands in question remain previous for the transmission of the chyle, the body nevertheless becomes emaciated, as if from an insufficient supply of chyle to the blood. These glands are cellular in their construction, and it is supposed that the matter contained in the lacteals entering into them is poured into these cells, which matter is taken up by the vessels running out of them in the way of absorption, and that thus something more than a mere passage mechanically, as it were, through the gland, is accomplished.

So far then every thing is to a certain degree evident on the function of assimilation. We have seen that a separation of the chyle from effete matter is effected in the upper part of the alimentary tube, and that the former is conveyed by distinct and appropriate conduits on to the blood-vessels. The chemical composition of the chyle we refer to the article CHEMISTRY; here limiting ourselves to saying that the contents of the thoracic duct have been found differently filled, according as the animal upon which the examination is made shall have fasted for a long time, or have lately taken food: in the latter case the fluid is more albuminous, and really chyliferous; in the former it has more of the character of lymph. Does not this circumstance, by the way, in some measure militate against the assumption of Magendie; that it is chyle, and chyle only that the lactiferous vessels will take up?

The lymphatic system of vessels is so similar in appearance to the lacteals that an inference has been made, from this similarity, in favor of their being the exclusive absorbents of the general frame, while the lacteals are principally the absorbents of the chyle. But it must be observed that their open mouths have never yet been discovered, so that when it is stated that they arise by such open orifices from different structures, and take up the fluid which these tissues pour out, we rather talk inferentially than in the way of demonstration.

Besides the chyle separated from the fæces in the small intestines, there are the halitus of the cavities, properly so called, especially that of the fauces and of all the mucous tela, the more watery part of those secreted fluids which are retained for some time in their ducts, i. e. in the breast, the vesiculæ seminales, the gall-bladder, &c., and not a small portion of the stellatious fluids, which are applied to the common integuments.

The solids, after performing their purpose in the animal economy, insensibly melt away, and are absorbed, as is proved by the greater part of the thymus gland during infancy, of the roots of the first teeth, and of the alveoli, after the second teeth have fallen out. The constant change of the whole osseous system, arising from the insensible renovation of bony matter, may also be adduced.

Indeed this process of absorption is so constant and so universal, that no part of an organised frame continues to have from day to day the same identity; in the fingers which now direct the pen of the writer not a particle of the same matter probably exists that constituted the structure of the parts a twelvemonth since, and the same mutation is incessantly going on through every part and portion of the frame; an argument has indeed hence been drawn against what is called materialism, since consciousness and identity remain, while the material particles of the body are thus unceasingly running their round of mutations.

We have already intimated that analogy led to the inference that as the lymphatics appear nearly the same in structure and peculiarities as the lacteals, the two systems together constitute the whole of the absorbing system; and this is in truth the generally received doctrine of the present day, more especially in this country, since the anatomy and peculiarities of the lymphatic system have been so ably elucidated by the labors of Hewson, John Hunter, and Mr. Cruickshank.

Some French and American and German physiologists have lately endeavoured to prove that the principal part of absorption is effected through the medium of the veins; thus in some measure reviving the old doctrine of imbibition into the blood, directly through the coats of vessels, and not by a distinct and exclusive system of organs.

The arguments of Magendie and others in favor of venous, as opposed to lymphatic absorption, are shortly the following:—In the first place they urge that the suddenness with which the secretions are sometimes affected is inconsistent with the notion of the course of absorbed fluids through the lymphatic and the thoracic duct (we should perhaps have premised that lymphatic absorption implies this course, since the termination of most of the branches of the lymphatics is into the thoracic duct); and still further they say, that as the urine often becomes tinged in a very short time with turpentine, rhubarb, copaiba, and other substances, while no such tinge is traceable in the lymph contained in the thoracic duct, it would seem that this channel is not their course to the kidneys. To this, however, it may be replied, that the fact militates equally against venous absorption itself, since the round of circulation must be performed equally in one case as in the other, and, moreover the blood is apparently often as free from the impregnation adduced, as the contents of the thoracic duct. Not, however, always.

The objectors further state that, when the thoracic duct of a dog is tied, an infusion of nux vomica injected into the stomach or rectum, kills as quickly as though the ducts were pervious. But in this case the nervous organisation may be the media of transmission; and it is not necessary to suppose any absorption at all for the production of the effect.

But we must here find room for one or two of the positive experiments in favor of the imbibing power of the venous coats, or of the admission of matter into the blood through these coats. A vein was placed in some acid liquor with its two extremities projecting from this liquor; then a stream of warm water was injected through the vein by its orifices, and, after continuing this injection for some time, the current of water which passed out of the lower orifice of the vein was sensibly impregnated with acidity. This fact, then, it is urged, proved a communication between the interior of the vein and the liquid in which its exterior was immersed; indeed, it showed actual venous absorption. But still the lymphatic physiologists reply to this, that the condition of a vessel may be changed by subjection to these trials; and it does not follow that the coats of a vessel would have thus proved pervious if it had been in its natural condition, and surrounded merely by the exhalations of the living body.

'Three ounces of diluted alcohol were given to a dog; in a quarter of an hour the blood of the animal had a decided smell of alcohol; the lymph of the thoracic duct had none.

'Half a pound of assafœtida dissolved in the same quantity of honey was given to a horse, which was afterwards fed as usual, and killed in sixteen hours. The smell of assafœtida was perceptible in the veins of the stomach, small intestines, and cæcum; but not in the arterial blood, nor in the lymph.'

It is allowed by the same author from whom we extract the account of the last two experiments, that in Fiedemann's and Gmelin's trials, among a variety of substances taken, colored, odorous, or saline, very few could be detected in the chyle, but many were found in the blood.

These and other experiments and observations which might be adduced, did our limits permit, have led to the inference that the only general absorbents are the veins; that the lacteals merely take up the chyle from the food; that the lymphatics are not in reality absorbents; and that the villi of the intestines are composed partly by venous twigs which absorb all the fluids in the intestines excepting the chyle; this last being taken up by the lacteals, and going into the blood through the receptaculum chyle and thoracic duct. It is supposed, moreover, that the intestinal fluids having been received by the veins are carried on to the heart and lungs, having first been conveyed into the liver by the vena portæ, whose function it is minutely to subdivide and mix with the blood the fluids thus absorbed; which subdivision and intermixture is necessary to prevent their proving detrimental.

The physiologists who thus argue against lymphatic absorption suppose the purpose which these vessels serve in the animal economy is that of conveying the finer parts of the blood to the heart, as the veins convey the grosser and colored portion of the fluid. And it must be confessed that their positions and inferences are considerably forcible. But, on the other hand, many facts favor the other side of the question: how, for instance, can we explain the circumstance of a poison inserted into a part of the frame, and running often with great rapidity along the course of a lymphatic trunk, unless this last vessel were possessed of an imbibing power, and its minute extremities had open mouths? A cancer of the breast may be often clearly traced in its progress through the adjoining lymphatics into the lymphatic glands of the axilla; and it is too well known that the extirpation of the diseased part is generally unavailing after the neighbouring glands have thus taken on disordered action, inasmuch as the lymphatic vessels now appear to have absorbed into the system that peculiar something upon which cancer depends; and have converted a topical into a constitutional ailment. Who does not know, also, that mercurial friction is the most availing when performed where the lymphatics and their glands are most numerous? In our observations also, on various imbibitions, we ought always to recollect that the lymphatics are connected with the veins. Some experiments nave even propelled mercury into the vena portæ through the lymphatic absorbents; and altogether we should say that although much may be advanced on both sides of the question, and although great credit is due to the ingenuity of the physiologists to whom we have alluded, we have still, perhaps, 'reason for believing that the economy of secretion and absorption is effected by two systems of vessels distinct from veins and arteries, and in a state of health continually holding a balance with each other.'

Is absorption effected by the surface? or, in other words, does the skin while it is entire—the outer skin—admit of the entrance into the body of any matter from without? This question, like that of lymphatic absorption itself, is still unsettled among physiologists, some embracing one, others arguing on the other side.

It is well known that by bathing the body in water thirst is oftentimes much alleviated, as is sometimes done by sailors when their supply of fresh water fails them; they often, indeed, in order to allay thirst, strip their shirts off, dip them into the water, and put them on wet. Here, it should seem, say those who defend the doctrine of cutaneous absorption, that some of the fluid applied to the surface must get into the fluids of the body. No; say their opponents, that does by no means follow; and we may ascribe the relief from thirst by this expedient, upon the principle of the grateful sensations produced, and the consequently altered conditions of those parts upon which thirst depends.

By the much quoted experiment of Dr. Watson, as well as by several others, it has however been shown that the actual weight of the body is occasionally increased without taking any thing into the stomach. Dr. W. gave a Newmarket jockey, previously to a race, a glass of wine, which weighed little more than an ounce, and upon his being weighed immediately after the course he was found to have increased thirty ounces, notwithstanding there must have been considerable expenditure of the fluids by perspiration. Here, however, the objectors to absorption by the surface are furnished with a reply; and they suggest that the matter by which the additional weight was given to the body might have been taken in by the lungs, which all allow are absorbing surfaces, because the cells are not, as on the exterior of the body, lined with cuticle. In order to meet this objection, experiments have been made of application to the surface of matters while the person was breathing through an aperture so that none of the matter, if any were diffused in the room, could have been taken into the system by the lungs; in some instances the results of these trials have favored one, and in others the other side of the question; and, probably, as well in this as in most other cases, an intermediate inference is the true one. Absorption may be generally difficult while the epidermis or scarf skin is entire; but it does not seem to form a complete barrier against the admission of every thing from without.

Richerand has the following remarks on this subject:—'The increased weight of the body after exercise in wet weather; the abundant secretion of urine after remaining long in the bath; the manifest enlargement of the glands of the groin after keeping the feet immersed for a considerable time in water; the effects of mecu ial frictions, &c., show in an unquestionable manner that absorption takes place through the skin, with more or less rapidity according to circumstances. It must, however, be taken into account that the means which promote cutaneous absorption, operate at least as much by altering the structure of the epidermis as by increasing the action of the absorbing surfaces. In this manner the bath appears to operate by softening the texture of the epidermis; and frictions by raising and displacing its scales.'

This last intimation of Richerand we think deserves particular attention in reference to the point in dispute; for it should seem that without actual abrasion of the outer skin its layers may, by rubbing or softening, be so taken of temporarily from the absorbing surface of the inner skin as to occasion substances to enter which would not otherwise. We all know that where the cuticle is thin absorption is attended with less difficulty than in other parts, and that rubbing certain matters on the surface will occasionally procure them an inlet when merely placing them on the surface would not have proved sufficient. The writer of this paper has often appeared to succeed in ordering the abdomen to be rubbed with castor oil, in cases where the irritability of the stomach had precluded the admission of purgatives by the mouth; and in one case, after a good deal of this kind of friction, some castor oil was detected in the urine which could not well be accounted for in any other way than by absorption from the surface: the surface, however, not being actually abraded.

The settling indeed of this dispute, respecting cutaneous absorption, is not a matter merely of physiological curiosity; but necessarily would have considerable bearing upon the question of the medicinal powers of impregnated baths, and other external applications beyond the circumstances of temperature or friction. But we should be wandering from our present duty in pursuing this path of investigation.

Of the Circulation of the Blood.

Had we been writing before the time of the great Harvey, the title of this section would have been—on the motion of the blood, and even on that nothing could have been said but what was in some sort vague, hypothetical, and unsatisfactory. To Harvey, and to Harvey alone, are we indebted for the demonstration of the course the blood takes in its distribution to the several and separate parts of the body; although he obtained only obloquy for his pains, and his practice as a physician became diminished in consequence. Harvey was physician to Bartholemew's hospital; he was forty-one when he promulgated the doctrine, and he is entitled to the glory, says Hume, of having made the discovery 'by reasoning alone, without any admixture of accident.' He deduced the inference that the blood goes from and to the heart in a circular way, principally from the disposition of the valves of that organ, and which are clearly so constructed as to admit the passage of a fluid only in one direction; to this he added the consideration that, when an artery is opened, the jet that flows from the puncture does so in a direction from the heart, and the flow is in the contrary direction when we open a vein, and a ligature upon an artery causing blood to accumulate on the side nearest the heart, while a ligature on a vein occasions the swell beyond the puncture. He found too that animals bled to death by wounds in arteries or veins. Subsequently the course of the blood was demonstrated by microscopic observations on cold blooded animals, as on frogs, which show a perpetual flow of blood from the heart to the arteries, and thence into the veins, completing the circular career.

The circulation was, it must be admitted, obscurely hinted at by Servetus, a Spanish physician, who was burnt to death by Calvin in 1553, for impugning a belief in the Trinity; but the passage on which so much stress has been laid as an anticipation of the Harveyan discovery, and which the writer of this paper has examined for the purpose of ascertaining its scope and compass, clearly amounts to nothing more than an announcement of the pulmonary circulation; and even that made in so obscure and imperfect a manner as to give the impression of the discoverer's being scarcely aware of the nature and extent of his own discovery.

In the article Anatomy will be found an account of the structure, form, and position, of the human heart; to that account, in pages 175 and 228, of vol. ii. we refer the reader; here merely calling attention to the circumstance that the organ is furnished with valves or circular folds of membranes that are so constructed as to fall down and admit the passage of a fluid into its cavity, but to be raised up by the contraction of the ventricle so as to prevent the exit of the fluid in the same direction in which it entered; it was from this construction of the heart, and from observing valvular bodies at the mouths of the great blood-vessels from the heart, which, as we have just stated, led Harvey to those reflections which terminated in his ascertainment of the circulation; and it is of great consequence for the physiological student to preserve a constant and clear recollection of the valves of the heart, as well as of the pulmonary artery and aorta, in order to become familiar with the mode in which the vital fluid effects its circuit—vital fluid, we say—not under the notion that vitality can be predicated of the blood any more than of other parts of a living organised body, but merely to express that this fluid is as it were the fountain from whence all parts of the system are supplied with pabulum for the various processes and operations of life. That life is in the blood is as bad philosophy almost as to say that the soul is in the pineal gland, or that affections reside in the heart; all notions of thus localising the living principle ought to be abandoned, with indeed every other that leads to the inference that we can, by searching, find out what life is, or where it is.

There is a great difficulty in following the course of the arteries from their commencement in the heart to their final destination. Authors talk of minute branches ending in the open mouths of exhalants which pour out a particular fluid, either on the surfaces of membranes or by themselves; and these inferences are made rather from what is seen in the way of effect than of actual structure, for no microscopic observations have hitherto succeeded in tracing these open endings of the vessels; and it is to this moment a disputed point by what machinery these several exhalations and secretions are effected, and whether the whole of what we are generally accustomed to consider exhalation or secretion from open extremities may not be merely oozings through the sides of close vessels. At any rate the termination of arteries into the veins is the only one, as stated in the article Anatomy, which has yet been absolutely demonstrated.

When considering the very curious subject of absorption we alluded to this question of vascular termination; at present we have only to do with the mode in which the communication is accomplished between the system of arteries and that of veins, or rather with the manner in which the blood is conveyed from one to another part of this admirable machinery.

The blood, returning from its circuit round the body, is received into the right or anterior auricle and ventricle; from this cavity it is projected through the great pulmonary arteries into the lungs; having circulated through these organs it returns by the pulmonary veins into the left or posterior auricle and ventricle, whence it gets into the aorta, through which it passes on to be distributed through the various ramifications of the arterial system, to be returned into the right or anterior part, whence we began the description of the blood's course. Neither right and left, nor anterior and posterior, are correctly descriptive of the sides of the heart, and physiologists often now use the term pulmonic to denote the side of the heart which used to be called the right, and systemic to indicate the left: the right as we have said being that part from which the lungs receive their supply of blood, and the left being the part for the supply of the whole system; this last being, as might be supposed, and as we have already said (see Anatomy page 288) the most powerful of the two cavities. A sort of double circulation, it will be observed, is thus effected, one through the lungs, and the other through the body generally, a fact to which we shall have to call the attention of the reader in the next section, which will treat of the respiratory process, and the purpose which it serves in the animal economy.

The motions of the heart are described as an alternate systole and diastole, or contraction and relaxation, of the auricles and ventricles in succession. Thus, when the ventricles distended with blood contract upon their contents to force the blood into the pulmonary artery and aorta, the auricles at this moment relax and receive a fresh supply from the pulmonary veins and from the vena cavæ. On applying the ear or a stethoscope, says Dr. Elliotson, to the region of the heart, the distinct sound of the action of the ventricles and auricles may at once be perceived. At the moment of the arterial pulse is heard a dull sound, and immediately afterwards, without any interval, a clearer sound, similar to the noise of a valve or to the licking of a dog. The former arises from the action of the ventricles, the latter from that of the auricles.

The former occupies about three-fourths of the whole time, the latter one-fourth or one-third, and then a pause occurs of another one-fourth. This is termed the rhythm of the heart's action.

The sounds of the heart are ordinarily heard in health between the cartilages of the fourth and seventh ribs, and under the inferior parts of the sternum; those of the left side of the heart in the former situation, those of the right in the latter.

The shock or stroke occurs at the contraction of the ventricles. The force and extent of the sound and of the shock, and the rhythm of the heart's action are variously altered in disease, and other sounds superadded.

'If,' says Richerhand, and we shall here make a long extract from this excellent physiologist, 'I am asked why the four cavities of the heart do not all contract at once, I answer that it is easier to assign the final than the proximate cause. If the contraction of these cavities had been simultaneous, instead of being successive, it is evident that the auricles could not have emptied themselves into the ventricles. The alternate action is moreover absolutely necessary, as the heart, any more than the other organs, is unable to keep up a perpetual action, the principle of its motion which is soon exhausted being incapable of restoring itself except during rest. But the alternations of action and repose in organs, which, like the heart, perform functions essential to life, must be extremely short in their duration, and at very close intervals.

'The cavities of the heart, however, are not entirely passive during dilatation, and the action of that organ does not wholly depend on the excitement of the blood in its parietes (a question that has been disputed), since the heart, after it has been torn from the body of a living animal, palpitates, its cavities contract and dilate though quite emptied of blood, and appear agitated by alternate motions, which become fainter as the part gets cold. If you attempt to check the diastole (dilatation) of the heart, this organ resists the hand which compresses it, and its cavities appear endowed with a power which Galen termed *pulsive*, in virtue of which they *dilate* to receive the blood, and not because they receive it. In that respect the heart differs essentially from the arteries whose dilatation is occasioned by the presence of the blood, whatever some physiologists may have said to the contrary. I have repeated, but unsuccessfully, the famous experiment by which it is attempted to be proved that these vessels have the power of moving independently of the presence of the blood (this is a question to which we shall immediately advert). An artery (continues Richerhand) tied and emptied of blood, contracts between the two ligatures, but is no longer seen to move in alternate contractions.

'The heart manifestiy shortens itself, and the base approaches towards the apex during the systole or contraction of the ventricles. If it became elongated as some anatomists have thought, the tricusped and nictial valves would be incapable of fulfilling the functions to which they are destined, since the columnæ carneæ, whose tendons are inserted in the edges of these valves, would keep them applied to the parietes of the ventricles. The pulsations which are felt in the intervals between the cartilages of the fifth and sixth true ribs are occasioned by the apex of the heart which strikes against the parietes of the chest. In the explanation of this phenomenon it is not necessary to admit the elongation of the heart during its systole; it is sufficient to consider that the base of the heart in which the auricles are situated, rests against the vertical column, and that these two cavities, by dilating at the same time, and by their inability to move the vertebræ before which they are situated, displace the heart and thrust it downwards and forwards. This motion depends likewise on the effort which the blood sent into the aorta makes to bring to a straight line the curvature of the artery, which reacts and carries downwards and forwards the whole mass of the heart, as it were, suspended to it.'

Magendie's remarks on the motions of the heart as externally perceived are the following:—

'Each time the ventricles contract the whole bulk of the heart is suddenly carried forward, and the apex of the organ strikes the left parietes of the chest opposite the space between the sixth and seventh true ribs.

'This displacement forwards of the heart during the systole has given rise to a long and obstinate controversy; some pretend that the heart shortens in contracting; others maintain that it lengthens, and that it ought necessarily to do so; for without this it would not be able to strike the parietes of the thorax, as it is more than an inch distant from it during the diastole. A great number of animals were uselessly sacrificed for the purpose of studying the motion of the heart, and the heart was seen to lengthen and shorten by different observers at the same time. But what experiment was not able to perform a very simple argument accomplished. Bassuel happened to drop in during the dispute, and showed that if the heart lengthened in the systole, the nictral and tricuspid valves kept down by the carnous columns would not be able to shut the auriculo-ventricular openings. The advocates for the lengthening of the heart no longer held out; but it remained to be demonstrated in what manner, when the ventricles shortened, the heart directs itself forward.'

Senac showed that this phenomenon depends on three things; 1st. The dilatation of the auricles, which is made during the contraction of the ventricles; 2d. The dilatation of the aorta and pulmonary artery, in consequence of the introduction of the blood, propelled thither by the ventricles; 3d. The erection of the arch of the aorta, produced by the contraction of the left ventricle.

As the determination of this point is a matter not merely of curiosity, but has some practical bearings, especially in reference to disordered conditions of the organ, and its consequent movements, we shall further extract from another celebrated physiologist a passage referring to the dispute, and add the comments on the passage by an able physiologist of this country.

'The systole,' says Blumenbach, 'of the ventricles, upon which is said to be spent one-third of the time of the whole action of the heart, is performed in such a way that their external portions are drawn towards their septum, and the apex of the heart towards the base. This at first sight seems disproved by the circumstance of the apex striking against the left nipple, and consequently appearing elongated,—a circumstance, however, to be attributed to the double impetus of the blood, flowing into the auricles and expelled from the ventricles, by which double impetus the heart must be driven against that part of the ribs.'

On this particular we have the following remarks from Dr. Elliotson :—

'Dr. W. Hunter accounted for this in 1746. The systole and diastole of the heart simply could not produce such an effect; nor could it have been produced if it had thrown the blood into a straight tube in the direction of the axis of the left ventricle, as is the case with fish and some other classes of animals; but by throwing the blood into a curved tube, viz. the aorta, that artery at its curve endeavours to throw itself into a straight line to increase its capacity; but the aorta being the fixed point against the back, and the heart in some degree loose and pendulous, the influence of its own action is thrown upon itself, and it is tilted from and against the inside of the chest.'

'Though this is generally allowed,' continues Dr. E., 'Haller remarks that in the frog also, which has a straight aorta, the point of the heart moves forward during the contraction; and some say that while the heart of a dog continues to palpitate after being extracted from the chest, the apex is lifted up at each contraction of the empty ventricles.

'The occurrence is ascribable likewise in some measure to the distension of the auricles; for Haller found the apex give the usual stroke at the nipple on his distending the left auricle with air, and Senac has shown a similar influence from the right auricle also.'

Dr. Barclay has the following passage on this point :—

'When the blood is forced into the arteries their curvatures near where they issue from the ventricles are from their distension lengthened, and extended towards straight lines; and, causing the heart to palpitate in their motions, compel it to describe the segment of a circle, when the apex moving aslantad and sinistrad, is made to strike against the left side. The same kind of motion having also been observed by the celebrated Haller in distending the left or systemic auricle, it must follow that the stroke which is given to the side may be the effect of two distinct causes, either acting separately or in combination; but acting on a heart obliquely situated as ours is in the cavity of the thorax, where the aspect of the base is aslantad and dextrad, and that of the apex sinistrad and sacrad. In combination as the first of the two by removing the pressure will facilitate the influx of the venous blood into the left or systemic auricle which is situated dorsad; so the second, by the influx of blood into the auricle, will contribute in its turn to facilitate the circular motion of the heart proceeding from the arteries.'

The power of the heart is in some measure restrained by the pericardium, and this circumstance ought always to be taken into consideration, both in natural and diseased conditions of the organs.

In respect to the quantity of blood which is transmitted at each ventricular contraction or systole into the arterial system, opinion in some measure varies. Blumenbach estimates the quantity transmitted into the aorta by each contraction of the ventricle at about two ounces, and he supposes that all the blood of the body must pass through the heart seventy-five times every hour. 'That the powers of the heart cannot,' he says, 'be accurately calculated is clear upon reflecting that neither the volume of the blood projected at each pulsation, nor the celerity nor distance of its projection, much less the obstacles to the powers of the heart, can be accurately determined. A rough calculation may be made by taking every probable conjecture together; v. c. if the mean mass of the blood is considered as ten pounds or 120 ounces; the pulsation seventy-five in a minute, or 4500 in an hour; and the quantity of blood expelled from the left ventricle at each contraction as two ounces; it follows that all the blood must pass through the heart seventy-five times every hour.' The mean quantity of blood is however estimated too low by this physiologist. Richerand on the same subject expresses himself in the following terms :—

The quantity of blood which each contraction of the ventricles sends into the aorta and pulmonary artery most probably does not exceed two ounces in each of these vessels. The force with which the heart acts on the blood which it sends into them is but imperfectly known, however numerous the calculations by which it has been endeavoured to solve this physiological problem. In fact, from Keil, who estimates at a few ounces only the force of the heart, to Borelli, who makes it amount to 180,000 lbs. we have the calculations of Michelot, Jurine, Robinson, Morgan, Hales, Sauvages, Cheselden, &c.; but, as Vecy D'Azyr observes, not one of these calculations is without some error, either anatomical or arithmetical; hence we may conclude, with Haller, that the force of the heart is great, but that it is perhaps impossible to estimate it with mathematical precision. If we open the chest in a living animal, and make a puncture in its heart, and introduce a finger into the wound, pretty considerable pressure is felt during the contraction of the ventricles. 'And,' says Blumenbach, 'the impetus of the blood passing from the heart may be conceived by the violence and altitude of the stream, projecting from a large wounded artery, situated near it. I have seen the blood driven at first to the distance of about five feet from the carotid of an adult and robust man. The experiments of Hales,' our author goes on to say, 'in which the blood was received into very long glass tubes fixed to the arteries of living animals, and the length of the projection measured, are indeed beautiful, like every thing done by this philosopher, who was calculated by nature for such enquiries. But, if the force of the heart is to be estimated in this way, we must take into account the pressure of the volume of blood contained in the tube, and gravitating upon the left ventricle. The result of Hales's calculations was, that the blood being projected from the human carotid to the height of seven feet and a half, and the surface of the left ventricle being fifteen square inches, a column of blood weighing 51·5 lbs. was incumbent upon the ventricle, and overcome by its systole.'

It is sufficiently evident, as indeed the later physiologists have admitted, that vital forces are not susceptible of the same kind of calculations and estimates as those exerted upon inert matter; and that therefore estimates founded upon the analogies of natural philosophy generally must in their very nature be fallacious. It is however at the same time evident that the heart must act with very considerable force in bringing about the circular impetus, even though we admit that it may be much assisted by the action of the vessels themselves. How far these last are instrumental towards completing the process we are presently to investigate; but let us first enquire what it is that excites the heart to contract, and consequently to propel its contained blood? The ancients were satisfied in replying to this question by supposing a pulsific virtue or power in the heart by which it commenced and carried on its actions; and Mr. John Hunter, in later times, talked with but little more precision of 'the stimulus of necessity' exciting the organ to contract. The following are the terms employed to express this idea by the able physiologist whom we have just named. 'The alternate contraction and relaxation of the heart constitute a part of the circulation; and the whole takes place in consequence of a necessity, the constitution demanding it and becoming a stimulus. It is rather, therefore, the want of repletion which makes a negative impression on the constitution, which becomes the stimulus, than the immediate impression of something applied to the heart. This we see to be the case wherever a constant supply, or some kind of aid, is wanted in consequence of some action. We have as regularly the stimulus for respiration; the moment one is finished an immediate demand taking place; and, if prevented, as this action is under the influence of the will, the stimulus of want is increased. We have the stimulus of want of food, which takes place regularly in health, and so it is with the circulation. The heart, we find, can rest one stroke, but the constitution feels it; even the mind and the heart are thereby stimulated to action. The constant want in the constitution of this action in the heart is as much as the constant action of the spring of a clock is to its pendulum, all hanging or depending upon each other.'

We have above called this mode of accounting for the systole and diastole of the heart, its alternate and unceasing contraction and dilatation, a vague one, not out of any disrespect to the great physiologist who has proposed it, but on the ground of its being merely a substitution of words for things, and a confounding the notion of final and efficient causes—a mistake which pervaded the reasonings of the ancients when they discussed the question of qualities and powers, but which ought not to have disfigured the otherwise masterly speculations and philosophising of Mr. John Hunter; and we are the rather disposed to dwell upon the error, inasmuch as there may be a disposition to receive it proportioned to the merit of the person propounding it. We are not indeed alone in our severity of comment in the present instance. We recollect being struck some twenty years since with the same kind of objection we are now urging to language of this kind, in Dr. Beddoes's preface to Brown's Elements of Medicine; and in an able book which now lies before us we meet with the following remarks on the doctrine of 'the stimulus of necessity.'

'Mr. Hunter's Treatise on the Blood is a work,' says Dr. Mason Good, 'of such sterling merit, so rich in facts, and so valuable in its remarks, that, notwithstanding a few nice spun and chimerical speculations that occasionally bewilder it, there is no book on physiology which the student ought to study more assiduously. Yet I am much afraid that the language now read,' alluding to the quotation we have above made, 'has no great deal of meaning in it; and that it does little more than tell us that the heart contracts because it does contract, or, rather, that the circulation takes place because it takes place.'

But the question recurs, what is the immediate or efficient cause of the heart's perpetual, or rather alternate, motion? Some have ascribed this to the stimulus of the blood acting upon the peculiar irritability of the heart; some to the excitement of the nervous system; and others to a vacuum taking place in the cavities, into which, according to the common laws of derivation, as it has been expressed, a vacuum takes place, and, blood thus rushing in, a contraction necessarily occurs to prevent over distension.

It would seem fair to infer that no one single principle can be looked up to as the sole source of the phenomenon in question, and that those who are busily employed on the one hand to prove that it is the stimulus of the blood, and on the other that it is that of the nerves, are both right and both wrong. Oxygen, as the universal excitant, was the favorite dictum of some physiologists soon after the pneumatic doctrines of animal life came to be propounded; but, as will be seen in the chapter on *Respiration*, a great deal had been taken for granted in reference to the reception of oxygen into the blood, or its absorption by that fluid, which subsequent experiments and reasonings have in some measure invalidated.

Perhaps the account given by Blumenbach of the rationale of the heart's action is as simple and satisfactory as any that has been offered. We shall therefore use the freedom of extracting it.

together with the comments of his able translator and annotator.

'The wonderful and, while life remains, constant strength of the heart is universally allowed to depend upon its irritability, in which it very far surpasses, especially as to duration, every other muscular part.

'That the parietes of the cavities are excited to contraction by the stimulus of the blood is proved by the experiment of Haller, who lengthened at pleasure the motion of either side of the heart by affording it the stimulus of blood for a longer period than the other.

'And yet,' says Dr. Elliotson, in remarking on this passage, 'the heart of frogs contracts and relaxes alternately for a length of time when out of the body and destitute of blood.' And he alludes further to the experiments of Mr. Brodie, who divided the great vessels in rabbits, and found the action of the heart 'apparently unaltered for at least two minutes after that viscus and the great blood vessels were empty of blood.' 'But the quantity of blood,' our commentator very properly adds, 'greatly influences the action of the heart.'

Blumenbach goes on to say, 'The great influence of the nerves over the heart is demonstrated by the size of the cardiac nerves, and by the great sympathy between the heart and most functions, however different. A convincing proof of this is the constant sympathy of the heart during the most perfect health with all the passions and with the primæ viæ in various disorders.

'The great importance of blood to the irritability of the heart is evident from the great abundance of blood vessels in its muscular substance.

'Nevertheless it is very probable that the importance of the nerves in this respect is greater in the voluntary muscles, and of the blood in the heart.

'Besides these two powers of the heart there is another which is mechanical, dependent upon structure, and contributing greatly in all probability to sustain the circulation. For, when the blood is expelled from the contracted cavities, a vacuum takes place, into which, according to the common laws of derivation, the blood from the venous trunks must rush, being prevented by means of valves from regurgitating.'

As the principle of vacuum to which Blumenbach here alludes will be found an important one, especially in the connexion which the respiratory has with the circulatory process, we shall further extract the remarks of Dr. E. on the text of his author, in reference to this point. 'The influence of the vacuum pointed out by Rudiger, enlarged upon by Dr. Andrew Wilson, and mentioned as probable by Haller, John Hunter, &c., has been very ably displayed by Dr. Carson of Liverpool. The quantity of blood, the length of its course, and the various obstacles opposed to its progress, render, in his opinion, the mere propulsive power of the heart insufficient to maintain the circulation perpetually. But assistance must be given by the vacuum, which takes place in all the cavities of the organ when the contraction of the muscular fibres is over. The blood is thus drawn into each relaxed cavity, and the heart performs the double office of a forcing and a suction pump. The situation of the valves of the heart is thus explained:—There are valves between the auricles and ventricles, and at the mouths of the two great arteries, because behind each of these four openings is a cavity of the heart, alternately dilating and affording a vacuum into which, were there no valves, the blood would be drawn retrograde. At the venous openings of the auricles no valves exist, because they do not open from a cavity of the heart—from a part ever experiencing a vacuum; and, therefore, the blood cannot, when the auricles contract, move retrograde, but will necessarily press forward into the ventricles, which at that moment are offering a vacuum.'—'All allow that, when the heart is relaxed, its cavities enlarge, though some ascribe this to its elasticity, and others regard it as a necessary consequence of the arrangement of its fibres. Experiment proves the same. Dr. Carson extracted the hearts of some frogs, and immediately put them into water, blood warm. They were thrown into violent action, and upon some occasions projected a small stream of a bloody color through the transparent fluid. The water could not have been projected unless previously imbibed. It was thought that a stream of the same kind continued to be projected at every succeeding contraction, but that after the first or second it ceased to be observable in consequence of the fluid, supposed to be imbibed and projected, losing its bloody tinge, and becoming transparent, or of the same color with the fluid in which the heart was immersed. The organ was felt to expand during relaxation—a fact stated long ago by Pechlin.'

A vacuum, in some way or other, or in some part or other, produced as one of the principles connected with circulating agency, is contended for by several physiologists. Dr. Barry has recently referred this vacuum to the respiratory process in a manner different from Dr. Carson, and we have just been looking over a paper in the Lancet, which attributes it to the repeated closing of the glottis; but we must not allow ourselves to proceed at present further into this enquiry, but go on to the consideration of another disputed point, viz. whether this projectile force of the heart, connected with its properties of suction, supposing them to exist, be sufficient to convey the blood the whole round of its circuit, or whether the vessels through which it flows are at all, or to what extent, auxiliary forces; whether, in other words, the arteries and veins are mere conduits, or whether any share is contributed by them to the propulsion of the blood.

Dr. Harvey, the great discoverer of the circulation, supposed the whole projecting power to reside in the heart, in which opinion he has been followed by physiologists of much note; and indeed the doctrine of the passivity, in some measure, of the arterial tubes has recently been revived, and ably defended by Parry and others. The reader, by turning to the article ANATOMY, will find that the coats of arteries have been described as consisting partly of muscular fibres; but it is contended by many that muscularity is erroneously conceived to appertain to these fibres, since they are destitute of fibrine, and do not contract upon the application of those stimuli which invariably produce this effect upon true muscular substance. It is further maintained that the alternate contractions and dilatations of arteries, in the manner just described as the actions of the heart, have never been proved even by those physiologists who award to them an independent and active power. Further, it is urged that a function so orderly and regular as that of the circulation cannot well be supposed obnoxious to those casualties which would be likely to arise out of a separate and independent action in the several conduits conveying the blood. The utmost power then that these philosophers award to the arteries is that of elasticity, and, as it is termed, tonicity, by which the dilatation from the impetus of the blood is kept within due limits, and thus the current maintained. These arguments are strengthened by allusions to diseased conditions. Bichat, for instance, whose theory of the circulation denies the abstract action of the arteries, remarks that all irregularities in the course of the blood imply a disordered condition of the heart itself, while the arteries may be ossified, to a very considerable degree and extent, without occasioning any disturbance. Some indeed have gone so far as to deny that, in the structure of the arterial tubes, any thing can be found that bears the remotest resemblance to muscle; thus Mr. Hare, in his work on the stomach, expresses himself in the following terms:—'Having sought in vain for the reputed muscular coat of an artery, I am led to conclude that the whole tube is constructed of cellular tissues, which, from its different degrees of density or compactness, appear to form separate coats; and which from its yielding power is fitted for all the purposes of circulation by the impulse which the blood receives from the heart alone, the great muscular power of which appears more than sufficient for propelling it through elastic tubes to all parts of the body.'

Those philosophers who defend the opposite doctrine, viz. that the arteries contract and dilate alternately, as does the heart, and thus assist in the circulation beyond the mere reception and transmission of blood, allege that the inference respecting the absence of muscularity in arteries, from their deficiency in fibrin is fallacious; since muscles themselves will sometimes resist all stimuli, excepting that of their specific or peculiar excitant. 'It would be too much,' says Mr. Charles Bell, who has written a very ingenious tract on the Circulation, 'to infer that the iris is not muscular because it does not act upon being pricked. We see that the heart, after it is exhausted and refuses to act whatever stimulus be applied, will contract when it is distended; because distension is its natural excitement. For the same reason an intestine will revive and act upon being distended with air, though it will not act upon being pricked with needles.' Arteries then, notwithstanding they are destitute of fibrin, may, it is argued, be provided with a faculty tantamount to positive muscularity when urged to action by their appropriate stimulus.

To the position above announced, that the contractions and dilatations of arteries have never been demonstrated, it is replied that the branches of vessels which have been laid bare and exposed to view for the purpose of ascertaining this point are not sufficiently large for their actions to be thus detected. 'The carotid artery,' says Mr. Bell, 'is six inches in length, and only half an inch in diameter; it elongates at each contraction of the heart a quarter of an inch, and of course rises in its bed in a curve to accommodate itself to its confined place. Suppose then (he adds) that it dilates in breadth in proportion to this elongation, should the dilatation be visible to me?'

Then again an argument is adduced on this side of the question from the difficulty of conceiving that such a small apparatus as is the heart should be equal to propelling the innumerable currents of blood at so many different angles, through many tortuous courses, contrary to the action in several cases of gravity, and under different circumstances external and internal of the body, to every portion of the system.

These systematists further argue that topical augmentation in arterial movements, in consequence of local excitation, is totally inconsistent with the notion that the alternate contraction and dilatations of the heart are the sole source of the blood's impetus.

But even admitting, it is said, that this local excitation might occasionally take place, consistently with the general passibility of the arterial tubes, how can we account without the assumption of positive, independent, arterial power, 'for sudden increase and diminution of secretion, for sudden and partial growth, for wasting and decay of parts while the general body is vigorous, for an organ being plentifully supplied with blood one hour, and the next left with a diminished quantity?' Further, say the objectors to the Harveyan and Parryean doctrine, 'to suppose that the heart is the only engine of circulating the blood, or even that it is the principal cause of the blood's motion, must leave us in perfect astonishment when we see it ossified in its substance, or encompassed with a tumor which surrounds it wholly, and adheres to it on all sides.'

But the principal difficulty which the hypothesis in question has to encounter would seem to be constituted by the circumstances connected with capillary circulation; especially in those structures which appear in some measure different from the mere termination of the arteries into small capillary tubes. It has already been said that other terminations of these vessels have been supposed, although, perhaps, not demonstrated: indeed, in some instances, it is difficult to account for the blood's entrance and exit without the admission of a species of extravasation, as in the case of the placenta, where the blood would appear to be thrown out into a sort of cellular structure, and taken up again into the venous system by a species of imbibing power. In these examples, then, and indeed in the mere interchange of blood from the capillary order of arteries to that of the veins, it seems difficult to account for the manner in which the blood finds its way into the radicles of the veins; if we suppose the whole of circulating agency to resolve itself into the momentum, or rather impelling power, of the heart; indeed, on either supposition or hypothesis, there appears much difficulty in tracing the blood through the capillary system of arteries, and into the capillaries of the veins, without assuming some imbibing or absorbent faculty on the part of the latter; whether that faculty be exerted at the heart itself, in the way intimated when we were considering the heart's action, or whether it be assisted by a power and principle of suction in the commencing extremities of the venous ramifications. We are told indeed, and told truly, that injections thrown forcibly into the arteries of a dead subject will be propelled on into the veins; but the mechanical powers which are manifested upon the extinction of the living principle must of course, to say the least, be much modified by the presence and agency of life.

It ought to be remarked that those individuals who deny the alternate contraction and dilatation of the arteries do not exactly defend their passivity; indeed the term tonicity, which Dr. Parry applies to express arterial condition, is inconsistent with such notion: all that they, at least most of them, mean to say in defence of the heart as the propelling power is this, that this power throws the blood into tubes, which, by their elasticity, open for its reception, and that this elasticity is prevented from acting beyond a certain measure by the structure of the vessel itself; so that the jet of blood which spirts out per saltem, as physiologists express themselves, upon a wound made into a large artery, is not so projected because the vessel from which it immediately proceeds acts and reacts, or rather contracts and dilates, as does the ventricle of the heart itself, but that the successive streams are caused by the contraction and relaxation of this last organ.

In the capillary system, even of the arterial tubes, this kind of motion is lost, the blood in the very small vessels flowing in an equal stream; and this circumstance is made use of in illustration and support of the principle to which we now refer; inasmuch, it is said, as the influence of the heart now becomes in a great measure lost: and although here the artery still does not lessen and enlarge, or dilate and contract, as does the organ from which all the blood issues, the power of the artery over its contained blood is now less dependent upon the heart's force, and the blood therefore flows more in the way of continued stream; still, however, dependent upon the impulse at the source and centre of circulation.

Anatomists, who admit of the fibrous coat of the artery, describe the capillary tubes as having these fibres in much larger proportion to the elastic tunic than is the case with the larger arteries, and this construction seems in harmony with the supposition now adduced, that in the vessels, and those more immediately under the control of the heart, elasticity is a principle mainly called into exercise; while contraction and propulsion are the agencies demanded from the capillaries.

It is a question in our minds whether both the advocates for and against the systole and diastole of the arteries may not, in some cases, have pushed their positions and arguments under too great a forgetfulness of vital powers and vital propulsions being differently governed from tubular machinery, and conveying conduits not endowed with the living principle. We have, therefore, been much pleased in meeting with the following remarks by Dr. Copland in his notes upon Richerand's Physiology, which, entirely coinciding with our own views on circulating impulse, we shall take the liberty of transcribing into our pages. Dr. Copland is remarking on some positions respecting the blood's motion made by Magendie, and he expresses himself as follows:—

'The arteries throughout the body are surrounded by the ganglial nerves. These nerves form a reticulum around them, from which reticulum very minute fibrillæ are given off and dip into their fibrous or muscular tunic.

'This particular disposition of the ganglial nerves on the arteries ought to be kept in recollection when we enquire into the functions of the latter. How far it tends, not only to the discharge of the more manifest action which the arterial system performs, but also to those insensible changes which the blood undergoes in health and disease, and to the assimilation of chyle and other absorbed materials conveyed into this fluid we have ventured to state at another place. We shall here merely take notice of an opinion relative to the operation of this class of vessels in the circulation of the blood, lately contended for by M. Magendie. This physiologist has inferred from his researches on the circulation,

'1. That neither the larger nor the smaller arteries present any trace of irritability.

'2. That they are dilated during the heart's systole.

'3. That they are capable of contracting themselves with sufficient force on the blood they contain, so as to propel it into the veins.

'4. That the blood in the arteries is not alternately at rest and in motion; but that it is, on the contrary, in a continued succedaneous (by little jets) motion in the trunks and ramifications, and uniform in the smallest ramifications and divisions.

'5. That the contraction of the left ventricle of the heart, and the elasticity of the larger and smaller arteries furnish a satisfactory mechanical reason for these phenomena.

'6. That the contraction of the heart and arteries has a considerable influence on the course of the blood through the veins.'

'We cannot concur,' says our commentator, 'in these conclusions, especially in the surprising inference which forms M. Magendie's fifth proposition, and we might, were it consistent with our limits, point out various fallacies in his experiments, to some of which, indeed, all experiments on living subjects are more or less liable, viz. the unnatural position of the animal during their performance, and more particularly as respects the operations of the part immediately its subject. (This by the way is a very important intimation, and not sufficiently attended to by some of our experimental physiologists.—Ed.) If M. Magendie limits the process to the mechanical means indicated above, we would ask how he accounts for the influence of mental motions, in determining the action of vessels in particular parts of the body? How the diversified influences of numerous external agents on the circulation can be explained? Wherefore so very opposite effects are produced upon the arteries when one extremity is placed in a pail of ice, and another in a pail of warm water? How can he reconcile his conclusions with the very satisfactory experiments performed by Sir Everard Home, Dr. Hastings, and others? and how can he account for the determination of blood to particular parts, whilst a diminished quantity is sent to other situations, if he discard the predominant or vital power which the vessels themselves, and especially their smaller ramifications, possess in virtue of the particular structure already noticed? We readily grant that the larger branches of arteries evince little or no contractile action, particularly in their natural state; but we contend that it increases as we advance towards the extreme capillaries, the action of which drives the blood to them in larger proportion, and thus increases both the mechanical and vital properties of the larger branches supplying them.

'We allow that the properties for which M. Magendie contends have an actual place in the process of arterial circulation; but they are not the only ones: they are insufficient of themselves to accomplish the purpose he assigns to them; and, moreover, they are secondary to, and controlled by, a superior influence.

'From these observations it may be perceived that the arteries act in the process of the circulation, not by means of contractile action similar to what is performed by the heart, nor yet by means of elasticity only, but by an organic or vital operation, which is nearly imperceptible in the larger branches, but which increases as we advance to the extreme capillaries; whilst on the contrary the elastic or mechanical properties augment as we proceed in the opposite direction.'

This last sentence of Dr. Copland seems to us to contain as much truth, or rather correctness, with respect to the rationale of arterial and cardiac impulse, as any that we have met with; but still it remains to be enquired by virtue of what influence the refluent part of the circulation, if we may so express it, is brought about? It has been already intimated that, without supposing a sort of imbibing power in the radicles of the venous capillaries, it is difficult to trace in idea the mode of interchange between the arterial and venous ramifications; especially when we take into account that in some spongy or cellular structures, there would appear to be a sort of extravasation of blood, or a throwing of it out from the termination of one system of vessels to be taken up again by another. But even allowing that something of this power is exerted at the extremities it still remains to be questioned how the blood is urged in a continued stream often against the force of gravity, and in many instances with other impediments, on to the auricle and ventricle of the heart? Here again we are brought to determine on the problem of the heart's power, but the power in this last case, as, indeed, we have before said, must be of a kind opposite to that of propulsion. On this head, perhaps, mechanical analogies have been too freely allowed to mingle with our reasonings, and vital peculiarities too much overlooked; but here we shall let another ingenious author express himself.

'It yet remains,' says Dr. Mason Good, after discoursing on arterial circumstances, 'It yet remains to account for the second half, or that which consists in the passage of the blood through the veins; and upon this subject there is one most important and elucidating fact which till of late has never been in any degree brought forward in the course of the enquiry. It is this, that when the heart, by the contraction of its ventricles, has exhausted itself of the blood contained within it, a comparative vacuum must follow, and the blood from the venæ cavæ, or venous system at large, be sucked up into the right auricle. This ingenious remark seems just to have been thrown out by Dr. Wilson Philip; and Dr. Carson of Liverpool, taking advantage of it, has constituted a simple and beautiful theory of the projectile powers employed in the circulation, the general principle of which may be expressed in a few words. The heart is supposed to act at one and the same time in a twofold capacity. By the contraction of the ventricles it propels the blood through the arteries; and by the dilatation of the auricles it draws it up from the veins. It is at once, therefore, a forcing and a suction pump. The contraction of the heart, and consequently its comparative vacuum, are supposed to be considerably assisted by the elasticity of the lungs and the play of the diaphragm, and the joint resistance which these afford to atmospherical pressure; whilst this very pressure, applied on every part of the exterior of the animal frame, continues in an equal degree to the ascent of the blood in the veins; for as the column of venous blood is perpetually girt on all sides, and cannot fall back because of the numerous valves with which the veins are furnished, it must necessarily take an opposite or ascending direction.

'There are, nevertheless, numerous difficulties that still remain to be explained, such as the proportion of projectile power furnished by the conducting pipes themselves; by what means the want of a diaphragm is compensated in birds and reptiles which have no such organ; and what constitutes the projectile power in animals that have no heart, and consequently no double pump to work with.'

Dr. Good might have added to these objections the circumstances which are exhibited in vegetable physiology, the rise and descent of the sap of plants, &c., which appear to be effected somewhat upon the same principles as the motion of the blood in the animal economy, and which, being obviously insusceptible of all the reasoning applied to the explanation of the latter upon mechanical predicates, must be referred to vital or organic laws.

'There is another curious fact which physiology has pointed out, but has never hitherto been able to explain, and that is, a direct communication between remote or unconnected organs apparently by some other channel than the circulation of the blood. Something of this kind seems to exist between the spleen and the stomach, the former of which has been proved by Sir Everard Home to receive fluids from the cardiac portion of the latter, though we can trace no intercourse of vessels. But the most extraordinary example of this kind which at present we seem to possess is the communication which exists between the stomach and the bladder; for the experiments of Sir Everard Home (Philosophical Transactions 1811, page 63), and the still more decisive ones of Dr. Wollaston and Dr. Marcet (Philosophical Transactions, p. 96) seem to have established beyond a controversy that certain substances introduced into the stomach, as rhubarb or prussiate of potassa, may pass into the bladder without taking the course of the blood vessels, and consequently by some other channel; a channel, indeed, of which we know nothing. This is a subject well worth studying; for if two organs, so remotely situated as the stomach and bladder, be thus capable of maintaining a peculiar intercourse, so other organs may possess a like intercommunion, and by such means lay a foundation for those numerous sympathies between distant parts which so often strike and astonish us. M. Magendie's hypothesis, that veins are absorbents, will explain the facts in Sir Everard Home's experiments, but has no bearing upon those of Dr. Wollaston and Dr. Marcet.

To this important fact in the animal economy we alluded when considering the subject of absorption; we now proceed to make some mention of the pulse which has a manifest connexion with the circulating impulse, but the mode and measure of which connexion, seem still in some degree sub judice points.

Upon what, let us ask of ourselves, does pulsation depend? Is it produced by the alternate contractions and dilatations of the arteries themselves? or is it the consequence of the heart's systole and diastole? does it depend upon the column of blood forcibly and momentarily, or at least in momentary succession, striking against the sides of the vessels and thus distending them? or is it a combined effect of all these circumstances and principles taken collectively?

That arterial contraction is not the cause of the pulse is proved by the fact that the beat of the vessel is felt, not at the moment of contraction, but dilatation; and let it be noticed that this arterial dilatation is not simultaneous with the dilatation of the heart, but is affected at the moment of the heart's contraction. We should be therefore probably correct in saying that the pulse is rather the consequence of an impulse communicated to the vessel by that portion of blood which is propelled into the arteries from the heart coming into contact with the antecedent columns; and that being resisted in some measure by the blood already in the vessel, it is thus forced against its sides and communicates to them their pulsatory motion. It may be easily conceived that something of the same kind would be effected upon a set of elastic pipes, even destitute of the living principle; were an injection in this successive way of a fluid to be made into them, the dislodgment of one column of fluid for the reception of another would be attended with that sort of pulsatory expansion which arterial dilatation produces.

In the capillaries and in the veins this projectile motion becomes lost; and hence, in these, the blood, as we have before said, is carried on more in the way of a continued stream, and no pulse or comparatively but little is felt in them. And in these last we may, by the way, remark that the circulation becoming more independent upon the heart itself, and more dependent upon other powers, exercise of the body, friction, and muscular contractions, however produced, assist the capillary and venous circulation in a marked degree: the pulse indeed is itself affected by these assistants to the circulatory impulse; but it is so rather in an indirect than immediate manner, since what throws more blood upon the heart must, cæteris paribus, cause greater and more powerful contractions of that organ, and of course greater and more powerful impulses upon the large branches of the arteries in which the pulse is felt.

On the differences of the pulse as constitutional, or characteristic of health on the one hand and disease on the other, it is scarcely within the province of physiology to descant; but a few remarks may be admitted here on this head as not altogether out of place.

We cannot but remark the difference of sentiment which has obtained among medical men on this subject: some asserting that there is neither ground nor necessity for a recognition of any difference in the pulsations as marking different conditions of the system further than the mere number of them; while others have divided and subdivided to a most whimsical extent. The truth in this case, as indeed in most other points that are controverted, would seem to be at some distance from either extreme, although we rather incline to think that those physiologists and pathologists who think more of number than kind are the nearest to the truth.

But on the nature and general doctrine of pulsation we have met with nothing more accordant with our own sentiments than the remarks which Dr. Mason Good has prefixed to one of the sections of his book entitled The Study of Medicine.

'The variations of the pulse have been ramified into so many divisions and subdivisions, and nice unnecessary distinctions, as to puzzle the young and be of no use to the old; and hence some of the best pathologists of modern times have been too much disposed to shake off nearly the whole of the incumbrance, and pay no attention whatever to the pulse except in regard to frequency. Among this number was Dr. Heberden; 'such minute distinctions of the several pulses,' says he, 'exist chiefly in the imagination of the makers, or at least have little place in the knowledge and cure of diseases. Time, indeed, has so fully set them aside, that most of those names of pulses are now as unheard of in practice as if they never had been given.'

'But this is to limit the subject to too strict a boundary, and to exclude ourselves from what, in many instances, are clear and even leading diagnostics. There are some practitioners, and of very high merit too, whose fingers are no more capable of catching the finer distinctions of the pulse than the ears of other persons are of the niceties of musical sounds. I suspect this was the case with Dr. Heberden, as it was also with the late Dr.

Hunter; of whom Mr. J. Hunter observes that, though he was extremely accurate in most things, he could never feel that nice distinction in the pulse that many others did, and was ready to suspect more nicety of discrimination than can really be found.'

'Dr. Fordyce's table of the pulse,' continues Dr. G., 'is perhaps unnecessarily complicated; but the strength or weakness, fulness or smallness, hardness or softness, regularity or irregularity, of the pulse are indications nearly as clear as its frequency or slowness, and in many cases quite as diagnostic of the general nature of the disease. Frequency and slowness of pulse taken by themselves indicate little more than the degree of irritability of the heart, or the force of the stimulus that is operating upon it. The strength and regularity, or weakness and irregularity, of the pulse are as palpable to the finger as the preceding signs, and show in characters nearly as decisive the degree of vigor or debility of the heart, and hereby, except where this organ is laboring under some local affection, the vigor or debility of the system which a mere variation in the state of the frequency of the pulse will not tell us. A full and a small pulse may be distinguished with almost as much ease as any other property it possesses; this Mr. John Hunter ascribed to the state of the arteries; but if I mistake not it gives us rather a measure of the quantity of blood circulating through the system than of the muscular strength of the arteries or of the heart itself. Hardness and softness of pulse, together with that vibrating thrill which has been called windiness, are not quite so easily learned as its fulness and smallness, but a nice finger will readily discriminate them. Dr. Fordyce makes them dependent, and I think with great reason, on the state of the arteries, rather than that of the heart, or on the quantity of the circulating fluid; and Mr. John Hunter concurs in the same view. They measure the degree of vascular tone or power of resistance; and when the same effect, whether above or below the natural standard, takes place in the capillary arteries, it produces that change in the pulse which he distinguishes by the name of obstruction and freedom, but which it is not always easy to discriminate from several of the preceding qualities.

'Thus far,' continues our author, 'the doctrine of pulsation may be studied to advantage; but when beyond this we come to a distinction between the free and dilated pulse, as proposed also by Dr. Fordyce; the quick and the frequent as proposed by Stahal; and the dicrotic, and inciduous, proposed by Solano as mere subvarieties of the rebounding or redoubling—itself a variety of the irregular pulse—we perplex pathology with a labyrinth in which the student is lost, and the master wanders to no purpose.'

Dr. Good has other remarks on the subject under discussion, but it is not the purpose of the present paper to go into pathological disquisition, and we have only ventured so far as we have under the feeling that the mind, being called a little to the modes in which variation may be manifested, is thereby assisted in judging of the natural condition of the powers that are the subjects of investigation; if, for example, the fact of the hard pulse be admitted, or that which gives a jar to the finger which presses the artery, the admission leads to the question and consideration of how far the tunics of the vessels themselves may influence the circulating impulse without reference to the beats of the heart. An elastic and fibrous power is, as we have seen, awarded by most physiologists to the arteries, while others have contended that these envelopments are merely membranous. Now, if we can detect a condition of the moving power which indicates a sort of opposition—which seems to say that elasticity is too soon and readily interfered with by contractility—we go some way towards settling the disputed point. Whether a hard wiry pulse does not manifest this intention, as it were, may be left for the readers' reflections to determine.

We should not do right in closing this section of our treatise without adverting more distinctly than we have hitherto done to the opposition which the blood has to meet with in pursuing its free course through the body; and to the question how far circulatory impulse is under the influence of powers exterior to the body.

We may first remark that the impulse of the circulating energy has to contend with the larger diameter of the general mass of the arteries, compared with that of the central source of circulation; this range of diameter augmenting, as it has been expressed, in proportion to the increase of the ramifications. It has indeed been stated that the aggregate diameter of the arterial system forms a cone, the apex of which is the heart.

Then again 'the short angles against which the blood has to strike, at the origin of the different branches,' must necessarily constitute a greater call upon the projectile force of the powers concerned in the circulation and the tortuous course that some of the arteries take, more especially those which enter the brain; though some physiologists have doubted whether this last circumstance can in any way operate towards resistance or impediment. Mr. Charles Bell, we recollect, expresses this doubt; but, though his objections to the principle may be ingenious, we should feel a reluctance in admitting any objections to a construction the final cause of which seems so apparent. In the case, for instance, of the bending and winding of the main artery which supplies the brain, it is almost demonstrative that this is a provision by nature against sudden impulses upon an organ which is so obnoxious to injury from these inordinate rushes of blood.

Natural gravity is another power which the circulation has in some measure to oppose, since the direction of the coming branches is upwards and lateral, as well as downwards and forward; and it has been supposed by some that the friction against the sides of the vessel is a source of impediment to freedom of propulsion.

Sufficiently obvious is it then that the force which has to meet and encounter these obstacles must not only be great but peculiar—by which last expression we mean that all calculations on mechanical and hydraulic principles, and that do not take into account vital causation and impulse, must necessarily be erroneous; although to a certain degree they apply, and in this modified or subordinate way do we find exterior influence operate upon the functions now under notice.

By density and rarity in the air—by the degree of atmospherical moisture or dryness—by different positions of the body—by changes in external temperature—by a greater or less fulness of the vascular system—by exercise or rest, &c., is the circulating impulse in some measure modified, while on the other hand the vital forces concerned in the phenomenon counteract these agencies to a very considerable extent. But to go into these principles and peculiarities would carry us beyond our limits, and we should besides be trespassing too much upon the province of pathology by discussing them to any extent. See MEDICINE.

ON RESPIRATION, &c.

The respiratory function has so obvious a connexion with that of the circulation that it seems especially in order to treat of one in immediate succession to the other; and, under this view of the dependence which the powers that move on the blood have upon the air which is taken into the lungs, it may be right to advert in the first instance to those speculations which have been thrown out as to the manner in which this relationship is maintained between the one and the other function. Having thus treated of the process of breathing, as connected with the circulation, we shall then advert to some other purposes which the organs of respiration are more immediately destined to effect;—more immediately, we say, because there is scarcely a function in the whole of the organised body upon which the inhalation of air by the lungs has not some, more or less, remote influence; for digestion, assimilation, secretion, nutrition, even the sentient system, and its various affections; and, in fine, every principle and property of the living machine, is interfered with by impediments or obstructions to the free play of the lungs and their appendages. When, then, we talk of the more immediate or direct purposes and dependencies of the pulmonary system, we mean to confine ourselves to the influence of breathing upon the blood; its composition, qualities, and mode of action; and to the furnishing of those communications and interchanges of sentiments and ideas which audible, and in the human frame articulate, sounds, are the media of.

'The respiratory function,' says Dr. Good, 'is maintained by a current of air alternately thrown into and out of the chest, and is subservient to two important purposes; that of furnishing us with speech, or the means of vocally communicating and interchanging our ideas; and that of carrying off from the blood a gas recrementary and deleterious to life; and, possibly, of introducing in its stead one or more gases indispensable to animal existence. Now, without the change thus effected upon the blood while it circulates through the lungs, the motion of the heart would soon cease altogether; and therefore it is that we say the circulatory has such a manifest connexion with the respiratory process.'

The structure of the lungs, their connexion with the trachea or air passages, and the mode in which the organs are supplied with blood, will be found described in the article ANATOMY. The organs thus constructed, and thus connected, are destined, from the moment that an infant becomes separated from its maternal attachment, to receive and expel a certain quantity of air; how this inspiration and expiration, which must continue while life continues, are brought about, does not seem very easy to be explained; some ascribing the commencement of respiration to one cause, some to another.

'The ordinary cause,' says Dr. Elliotson, 'of the first inspiration, appears to be the novel impression of cool air upon the surface; for if at any time we are suddenly exposed to a cold wind, or plunged into cold water, the diaphragm and intercostal muscles instantly contract, and a sudden inspiration takes place. The blood rushes into the expanded lungs, and, being afterwards obstructed when the inspiratory muscles seem to act and the elastic lungs shrink, gives rise to an uneasy sensation, which is instinctively removed by another inspiration, and thus respiration continues through life.' The fact of respiration commencing before the chord is tied shows that neither congestion in the aorta, nor deficiency of chemical changes, is the cause of the first inspiration. If an animal is born under warm water, its respiration begins at the moment you choose to bring it up into the air. Buffon proved this by causing a bitch's accouchement to take place in a tub of warm water, and allowing the pups to remain there for half an hour. The power of excitement of the surface to cause inspiration has been recently shown by Bichard and others, who, on mechanically irritating fœtal kittens still enclosed in the membranes, found inspiratory efforts take place at each irritation.'

The following extract from Dr. Darwin, on the subject of respiration, gives a somewhat different account of its primary cause. 'Respiration,' says this physiologist, 'is immediately caused by the sensorial power of sensation, in consequence of the baneful want of vital air, and not from the accumulation of blood in the lungs, as that might be carried on by inhaling azote alone, without the oxygenous part of the atmosphere. The action of respiration is thus similar to the act of swallowing our food to appease the pains of hunger; but the lungs being surrounded with air, their proper pabulum, no intermediate voluntary exertions are required, as in hunger, to obtain and prepare the proper material.'

Blumenbach's views of the primary source of respiration are expressed in the following manner:—'When the child is born, and capable of volition, the congestion of blood that takes place in the aorta from the obstruction in the umbilical arteries; the danger of suffocation, from the cessation of those changes in the blood in regard of the oxygen and carbon; the novel impression of that element into which the child, hitherto an aquatic being, is conveyed, the cooler temperature to which it is now exposed; and the many new stimuli which are now applied; seem to induce new motions in the body; especially the dilatation of the chest, and the first inspiration.'

Of these accounts we rather prefer the last, as it seems to explain the phenomenon by referring to several particulars, rather than aiming to seize hold of one principle and source; an error which reasoners are apt to be led into from their natural wish to generalise. But, after all, these functions seem rather referrible to the laws of organisation than susceptible of explanation by any of these appeals to final cause: there is no stimulus of pain required to set going the first actions of individuals in the vegetable creation; and the chord is separated, and inspirations commence, in some animals of the mammalia class, without any expression which denotes uneasy feeling. But it must be granted, in favor of our theorist, that crying seems as natural to a child from its birth, as the birth itself.

Upon whatever principle, however, the commencement of respiration is to be explained, certain it is, as Dr. Darwin has stated, that the process continues to proceed through life, without the intervention of sensation; and we now proceed to present the reader with an account of this process from one of our most able physiologists, Dr. Richerand.

In man, and all warm-blooded animals with a heart containing two auricles and two ventricles, the blood which has been conveyed to all the organs by the arteries, and which has been brought back by the veins to the heart, cannot return to it without having previously passed through the lungs, which are viscera destined to the transmission of the air, of a spongy texture, and through which the blood must of necessity circulate to get from the right to the left cavities of the heart. This course of the blood constitutes the pulmonary or lesser circulation; it does not exist in some cold-blooded animals. In reptiles, for instance, the heart has but one auricle and one ventricle; the pulmonary artery in them arises from the aorta, and conveys but a small proportion of the blood; hence the habitual temperature of these animals is much lower than that of man. For the same reason too there exists so small a difference between their venous and arterial blood, the quantity of fluid vivified by exposure to the air in the pulmonary vessel being too small to effect, by its union with the general mass, a material change on its qualities.

Mayow has given the most accurate notion of the respiratory organ, by comparing it to a pair of bellows containing an empty bladder, the neck of which, by being adapted to that of the bellows, should admit air on drawing asunder its sides. The air, in fact, enters the lungs only when the chest dilates and enlarges by the separation of its parietes. The agents of respiration are therefore the muscles which move the parietes of the chest; these are formed of osseous and soft parts, in such a manner as to possess a solidity proportioned to the importance of the organs which the chest contains, besides a capacity of motion required to carry on the functions entrusted to them.

To carry on respiration, which may be defined the alternate ingress of air into the lungs and its egress from those organs, it is necessary that the dimensions of the chest should be enlarged (this active dilatation of the cavity of the chest is called inspiration), and that it should contract to expel the air which it had received during the first process. This second action is called expiration; it is always of shorter duration than the former; its agents are more mechanical, and the muscles have less influence upon it.

In health the chest dilates only by the descent of the diaphragm. The curved fibres of that muscle, strengthened in contraction, descend towards the abdomen and compress the viscera. The descent of the viscera thrusts forward the anterior parietes of that cavity, and these recede when on expiration taking place after inspiration the diaphragm now relaxed rises, pressed upward by the abdominal muscle, compressed themselves by the large muscles of the abdomen. But, when it is necessary to take into the chest a great quantity of air; it is not sufficient that it should be enlarged merely by the descent of the diaphragm, it is required besides that its dimensions should be increased in every direction. The intercostal muscles then contract, and endeavour to bring together the ribs, between which they are situated. The intercostal spaces, however, become wider, especially at their anterior part; for whenever lines, falling obliquely on a vertical line change their directions, approaching to a right angle, the intermediate spaces receive the greater increase, as the lines, more oblique at first, become at last more nearly horizontal. Besides, as the ribs are curved in the course of their length in two directions, and both in the direction of their faces, and edgewise, the convexity of the first curvature is outwards, the ribs recede to a distance from the axis of the chest, whose cavity is enlarged transversely; while the second curvature (on the direction of their edge) being increased by a real twisting of these bones, and which reaches to the cartilaginous parts, the sternum is heaved forwards and upwards, so that the posterior extremity of the ribs is removed from their sternal end. But as the ribs are not all equally moveable, as the first is almost always invariably fixed, and as the others are moveable in proportion to their length, the sternum is tilted in such a way that the lowermost extremity is thrust forward. The diameter of the chest from the fore to the back part increases, therefore, as well as the transverse diameter. This increase of dimensions has been estimated at two inches to each of these diameters; the dimensions of the vertical diameter, which are regulated by the depression of the diaphragm, are much greater.

Professor Sabatier, in his Memoir on the Motion of the Ribs and on the Action of the Intercostal Muscles, maintains that, during the action of inspiration, the upper ribs alone rise, that the lower ribs descend and slightly close on the chest, while the middle ribs project outwardly; and that in exspiration the former set of ribs descend; that the latter start a little outwardly, and that the middle set never act on the cavity of the chest. The learned professor adds, that the cartilaginous articulating surfaces by which the ribs are connected with the transverse processes of the vertebræ appear to him to favor these different motions, as the direction of the articulations of upper ribs is upward, and that of the lower downward; but on considering the subject with attention it will be seen that the surfaces by which the transverse processes of the vertebræ are articulated to the tuberosity of the ribs are turned directly forwards in the greatest number, some of the lower ribs are at the same time directed slightly upward. If we examine the action of the bones of the chest during inspiration in a very thin person, for example in phthisical patients whose bones are covered with little else than skin, we shall find that all the ribs rise and are carried somewhat outwardly. It is not easy to conceive how the intercostal muscles, which professor Sabatier considers as the agents of respiration, should elevate the upper ribs and depress the lower. The diaphragm, whose circumference is inserted in the latter, might by its contraction produce this effect; but, as the intercostals have their fixed point of action in the upper ribs, they oppose and neutralise this effort, and all the ribs are elevated at once. If this were not the case the ribs ought to be depressed whenever the intercostals contract, since the lowermost, fixed by the diaphragm, would become the fixed point on which all the others should move.

As the fibres of the external and internal intercostal muscles are in direct opposition to each other, those of the former set of muscles, having an oblique direction from above downward, and from behind forward, and crossing the fibres of the other set whose obliquity is in a different direction, several physiologists have thought that these muscles were opposed to each other; that the internal intercostal muscles brought together the ribs, after they had been separated by the external intercostals, the one set being muscles of expiration, while the other set contracted during inspiration.

It is well known with what pertinacity Hamberger, in other respects a physiologist of considerable merit, defended this erroneous opinion in his dispute with Haller; it is now, however, ascertained that all the intercostal muscles concur in dilating the chest, and that they ought to be ranked amongst the agents of inspiration, because the unequal capacity of motion in the ribs prevents the internal intercostals, the lower insertion of which is nearer to the articulation of these bones to the vertebræ, from depressing the upper ribs. Of the very conclusive experiments by which Haller undertook to refute the arguments of his adversary, I shall relate only that which is performed by stripping the parietes of the chest, in a living animal, of all the muscles which cover it, and by removing in different parts of the thorax some of the external intercostal muscles. The internal intercostals are then seen to contract during inspiration together with the remaining external intercostals. These muscles, therefore, have a common action, and are not in opposition to each other. The same experiment serves to prove the increased dimensions of the space between the ribs. On holding one's finger between two of the ribs, it feels less confined, when during inspiration these bones rise and thrust forward the sternum.

This question being at rest, although in pursuit of science one should enquire how things are affected and not wherefore they come to pass, one feels naturally desirous to know what purpose is answered by the different directions of the fibres of the two sets of intercostal muscles; and with what view nature has departed from her wonted simplicity in giving to their fibres opposite direction. In answer to this, it may be stated that the action of powers applied obliquely to a lever, being decomposed in consequence of that obliquity, a part of the action of the external intercostals would tend to draw the ribs towards the vertical column, which could not happen without forcing back the sternum if the internal intercostals did not tend to bring forward the ribs, at the same time that they elevate them; so that these two muscular planes, united in their action of raising the ribs, antagonise and reciprocally neutralise each other in the effort by which they tend to draw them in different directions.

To this advantage, of mutually correcting the effects that would result from their respective obliquity, may be added the benefit arising from a texture capable of greater resistance; it is clearly obvious that a tissue whose threads cross each other is firmer than one in which all the threads merely in juxta-position, or united by means of another substance, should lie all in the same direction. Hence nature has adopted this arrangement in the formation of the muscular planes constituting the anterior and lateral parietes of the abdomen, without which the abdominal viscera would frequently have formed herniary tumors by separating the fibres and getting engaged between them. In this respect one may compare the tissue of the abdominal parietes, in which the fibres of the external and internal oblique muscles which cross each other are themselves crossed by the fibres of the transversales, to the tissue of those stuffs whose threads cross each other, or rather to wickerwork, to which basket-makers give so much strength by interweaving the osier in every direction.

When from any cause respiration becomes difficult and the diaphragm is prevented descending towards the abdomen, or the motion of inspiration impeded in any way, the intercostals are not alone employed in dilating the chest, but are assisted by several other auxiliary muscles; the scaleni, the subclavii, the pectorales, the serrati magni, and the latissimi dorsi, by contracting elevate the ribs and increase in more directions than one the diameter of the chest. The fixed point of these muscles, then becomes their moveable point, the cervical column, the clavicle, the scapula, and the humors, being kept fixed by other powers which it is unnecessary to enumerate. Whoever witnesses a fit of convulsive asthma, or of a suffocating cough, will readily understand the importance and action of these auxiliary muscles.

Inspiration is truly a state of action; an effort of contractile organs which must cease when they are relaxed. The expiration which follows is passive, and assisted by very few muscles, and depends chiefly on the reaction of the elastic parts entering into the structure of the parietes of the chest. We have seen that the cartilages of the ribs are pretty considerably twisted, so as to carry outwards and downwards their upper edge; when the cause which occasions this twisting ceases to act, these parts return to their natural condition, and bring back the sternum towards the vertebral column, towards which the ribs descend from their weight. The diaphragm is forced towards the chest by the abdominal viscera, which are compressed by the broad muscles of the abdomen.

In every effort of expiration, as in cough and vomiting, these muscles react, not merely by their own elasticity, but they besides contract and tend to approach towards the vertical column, by pressing upwards the abdominal viscera towards the chest. The triangularis sterni, the subcostales, and the serratus inferior posticus, may be likewise ranked among the agents of expiration; but they appear to be seldom employed, and to be too slender and weak to contribute much to the contraction of the chest.

When the chest enlarges, the lungs dilate and follow its parietes, as these recede from each other. These two viscera, soft, spongy, and of less specific gravity than water, covered by the pleura which is reflected over them, are always in contact with the portion of that membrane which lines the cavity of the thorax; no air is interposed between their surfaces (which are habitually moistened by a serous fluid exuding from the pleura), and that membrane, as may be seen by opening under water the body of a living animal, when no air will be seen to escape. As the lungs dilate their vessels expand, and the blood circulates through them more freely; the air contained in the innumerable cells of their tissue becomes rarified in proportion as the space in which it is contained is enlarged. Besides the warmth communicated to it by the surrounding parts enables it in a very imperfect manner to resist the pressure of the atmosphere rushing through the nostrils and mouth into the lungs by the opening into the larynx which is always pervious except during deglutition.

Physiologists, for the most part, consider the bronchial arteries as the nutritious vessels of the lungs. They assert that, as the blood which flows along the branches of the pulmonary artery resembles venous blood, it is unfit for the nutrition of the lungs, and that it was necessary that these organs should be supplied by arteries arising from the aorta, and containing blood analogous to that which is sent to every part of the body. But though it is admitted that this venous blood, brought from every part of the body and sent into the lungs by this principal artery, may not be fit to maintain the organ in its natural economy, this blood is fit for that use when, after being made hot, spumous, and florid, by the absorption of the atmospherical oxygen, it returns by the pulmonary veins into the left cavities of the heart.

It was long believed, on the authority of Willis, that the aërial tissue of the lungs is vesicular, and that each ramification of the bronchiæ terminated in their substance in the form of a small ampulla; but at present most anatomists adopt the opinion of Helvetius. According to Helvetius, every air vessel terminates in a small lobe, or kind of sponge, fitted for the reception of air, and formed of a number of cells communicating together. These lobes, united by cellular tissue, form larger lobes, and these together form the mass of the lungs.

The tissue that connects together the different lobes is very different from that in which the ramifications of the bronchiæ terminate: air never penetrates into it, except when the tissue of the air cells is ruptured. On such occasions, which are not of rare occurrence, on account of the excessive thinness of the laminæ of the air cells of that tissue, the lung loses its form, and becomes emphysematous. Haller estimates at about the thousandth part of an inch the thickness of the parietes of the air cells; and, as the extreme ramifications of the pulmonary vessels are distributed on these parietes, the blood is almost in immediate contact with the air. There can be no doubt that the oxygen of the atmosphere acts on the blood under such circumstances, since it alters its qualities, and communicates to it a florid red color, when enclosed in a hog's bladder, and placed under a vessel filled with oxygen gas.'

Thus far M. Richerand. He goes on to say that every time the chest dilates in an adult there enter into the lungs between thirty and forty cubic inches of atmospheric air; and he further endeavours to make good the assumption which we have found in the above extract, that oxygen is absorbed in the passage of blood through the lungs. Whether this hypothesis be capable of substantiation we shall presently enquire; but first we shall extract Dr. Carson's account of the mechanism of respiration, as given by Dr. Elliotson in his notes on Blumenbach.

'The substance of the lungs,' says Dr. C., 'is highly elastic, and constantly kept in a forced state of distension after birth by the pressure of the atmosphere. This is evident also from the lungs collapsing upon our puncturing the walls of the thorax, a circumstance arising from the atmospheric pressure on the one hand becoming counterbalanced on the other, so that their elasticity, experiencing no opposition, becomes effective. During inspiration the intercostal muscles raise and draw out the ribs, and the diaphragm descends; the enlargement of the thoracic cavity is instantly followed of necessity by the greater distension of the substance of the lungs from the diminished resistance to the atmosphere, gravitating in the bronchiæ. The diaphragm and intercostal muscles ceasing to act, the substance of the lungs exerts its elasticity with effect, recovers its former dimensions, and drives out the additional volume of air just admitted, and the passive diaphragm follows the shrinking substance of the lungs, offering from its relaxation no resistance to the atmospheric pressure on the surface of the abdomen. Thus expiration is produced. The muscular power of the diaphragm and intercostal muscles is far greater than the elastic power of the lungs, and therefore, when exerted, overcomes it, producing inspiration; but, ceasing to be exerted, the elastic power gains efficiency and produces expiration. To the elastic, others add the muscular power of the bronchiæ, and altogether suppose the respiratory process to be more independent upon exterior powers than has been assumed. 'In the common account of respiration,' says Dr. Elliotson, 'the elasticity and muscularity of the lungs are unnoticed, and expiration is ascribed to the elasticity of the cartilages of the ribs, and to the contraction of the abdominal muscles emptying the lungs by pressure. Now, according to Dr. Carson, in the first place the elasticity and muscularity of the lungs is itself sufficient for the purpose; in the second there is no proof of the agency of the abdominal muscles in expiration; it proceeds equally well in cases of inanition, when their contraction would rather enlarge than diminish the abdominal cavity, and in experiments when they are entirely removed from animals—a child was born without them, and had lived eighteen months at the time of the publication of its case, and was very well; and, I may add, thirdly, that although the elasticity of the cartilages of the ribs must conspire with that of the lungs, numerous cases are recorded of immobility of the ribs, by ossification of their connexions, where ossification was not materially impeded. These causes are adduced to show that the diaphragm is the chief instrument of respiration; but, as its elasticity cannot produce expiration, they show that this was accomplished entirely, or in a great measure, by the lungs themselves. Even where there is no ossification, the motion of the ribs has very little share in respiration; and Dr. Bostock considers the chief use of the intercostals to be that of giving a fixed point for the action of the diaphragm; and the operation of the abdominal muscles in expiration to be nearly passive. It is commonly known, however, that if the pleura is wounded air rushes into the chest during inspiration only, and is in some measure expelled again during expiration. Were the ascent of the diaphragm, and descent of the ribs, in expiration, the effect of solely the contraction of the lungs, of a tendency to vacuum occasioned by their shrinking, air and fluids should stream to the chest as much during expiration as inspiration, should rush to fill up the vacuum as much as the diaphragm should ascend, and the ribs descend, for that purpose: nor should air be expelled from the wounded pleura; for we may regard the thoracic cavity as bounded above by the surface of the lungs, and always, in the sound state, possessing the same dimensions; the expansion of the lungs being commensurate with the descent of the diaphragm and ascent of the ribs, and the descent of the diaphragm and ascent of the ribs commensurate with the shrinking of the lungs. The fact that air does not stream into the wounded pleura in expiration, but even streams from it, while the ribs are moveable and the abdominal muscles active, proves that the descent of the ribs, and ascent of the diaphragm, one or both, in ordinary expiration, do partly occasion by compression the diminution of the lungs, or, at least, are not its passive effect, but coincide with it by independent powers, which are the elasticity of the elevated ribs (and displaced abdominal organs ?), if not the contraction of the extended abdominal muscles. Haller refers expiration to the pressure of the lungs by the elastic ribs, and the abdominal and other muscles, and to the elastic and muscular contraction of the lungs themselves, which he considers more forcible than the compression. It appears to me that he is right; but that nevertheless either the lungs alone, or the walls of the chest alone, are able, when unassisted by the other, to produce expiration. The change in the situation of the ribs is moreover trifling compared to that of the diaphragm; and respiration often succeeds very well by the diaphragm alone. Animals which are remarkable for swiftness and perseverance in the race, scarcely employ the intercostal muscles, using the diaphragm almost solely.

'The beautiful contrivance in the shape of the thorax deserves attention. By its being conical every degree of motion in the diaphragm produces a greater effect on the capacity of the chest than could occur were it of any other shape.

'The passage of the air into the cells may be distinctly heard on applying the ear to the corresponding part of the chest, and is called by Laennie the respiratory murmur. It is much louder in children, and in them the cells are far more numerous and small. Whence an equal portion of lung from an infant a few days old weighs fourteen times more than from a man of seventy.

'The elasticity and muscularity of the lungs are not sufficiently great to expel the whole of this air in expiration. Thus they remain constantly in a certain degree of distension.'

By these extracts the reader will perceive that, as in the case of the circulation, it is still in some measure a sub judice point how far the heart acts independently upon other powers towards propelling the blood; so in the case of respiration different physiologists take different views of the share which the diaphragm, the ribs, the abdominal, and the thoracic muscles have in the act; some indeed ascribing the main part of the process to an independent elasticity and muscularity of the lungs themselves, while others give the principal credit to surrounding and extraneous parts: to us it would appear that the intermediate opinion even on this head, as it is on most others, is nearest the truth; and that nature has so constructed the whole of the pulmonary apparatus as for all parts to contribute their share towards the production of the effect in ordinary cases, while in extraordinary, or where one or more of the appendages are interfered with, a greater call being then made on the organs themselves, a commensurately greater power is then summoned to act.

That respiration should be performed with facility and freedom not only is a certain degree of integrity implied on the part of the organs themselves, and their assistants, if we may so name them, but it is likewise necessary that the circumambient air should be in due appropriation to the demands of the pulmonary apparatus; although even in this last respect nature does wonders often in accommodating powers to accidental deviations. The conditions of the air to which we allude are physical and chemical —that is, a certain measure of density or rarity, humidity or dryness, is looked for by the lungs for their free play and action; but it is still perhaps more essential for the proper performance of the respiratory process, and for the full effect of the influence of that process, that the chemical composition of the air be in due adjustment. Respecting this last circumstance we shall presently then speak more at large, but first it will be right to introduce a few words on what we have just called the physical relation of the air to the lungs, in opposition to its chemical qualities and powers.

It is well known to natural philosophers that the earth is surrounded with a subtle and transparent fluid, called air; that this circumambient fluid, if it be proper to apply the term to air, presses upon all bodies which it surrounds, enters into all open spaces of these bodies, and forces itself laterally or upon the sides of the bodies as well as upon their tops or vertically. This air is compressible to an almost unlimited extent, and spaces are occupied by it in the inverse ratio of the pressure that is made upon it. Now this pressure is varied in some measure even upon the surface of the earth, according to the different conditions of humidity or heat with which the atmosphere is at the time charged; but, when we ascend to considerable heights above the surface of the globe, the pressure is much less, a difference which is perceptible even upon the summits of mountains; and thus it is that the pulmonary vacuity, which immediately upon birth the air rushes in to occupy, is differently supplied with its quantum of air, according as the pressure and density, or opposite states, are present. It would be leading us too much into the doctrines of pathology to trace these variations, and their effects upon the respiratory and other organs; it is here sufficient to have referred to the principle of air constantly seeking a vacuum to occupy, and rushing in all directions to supply this vacuum with more or less rapidity and force, according to the pressure from above, to prove that, while both inspiration and expiration are greatly regulated by the vital powers and properties of the lungs and their appendages, much also in the phenomenon of breathing has dependence upon, and relation to, the different measures of elasticity and compressibility of the atmosphere itself. Some physiologists, indeed, as we shall immediately see, account for the main circumstance upon which vitality depends; viz. the circulation of the blood upon temporary vacua being produced; and even those who do not follow these reasoners through all their assumptions and inferences allow that much even of vital circumstance is modified by the gravity of the air and its tendency to an equilibrium.

The quantity of air that enters the lungs at each inspiration has been stated, with some variation; and this variation has doubtless more dependence upon the circumstances of the individual than upon the inaccuracy of the experimenter. Allen and Pepys have estimated that at each inspiration about 16·5 cubic inches are inhaled by a stout adult man, and that the quantity found in the lungs after death is about 100 cubic inches. 'Dr. Bostock, agreeing with Menzies and many others, believes forty cubic inches to be the average inspiration, and thinks that 161 or 170 remain in the lungs after ordinary expiration, for these organs are never emptied by expiration.' The ordinary quantity of aqueous vapor emitted by the lungs, trachea, mouth, and throat, may be about twenty ounces in twenty-four hours! The different inspirations made in a given time vary, as well as the quantity of air taken in by each inspiration. The alternations of inspiration and expiration are stated by Blumenbach to be about fourteen times in a minute; once to about five pulsations of the heart. Hales estimated the average number of inspirations at about twenty; and this perhaps is pretty nearly correct. 'By taking twenty as the medium,' says Magendie, '28,000 inspirations take place in twenty-four hours. But it is probable this number is subject to considerable variations from a variety of circumstances, such as during sleep, motion, distension of the stomach with food, the capacity of the chest, moral affections, &c.'

Besides those interruptions in the process of breathing which have place from more temporary or more permanent alterations from the condition of health in the pulmonary organisation, and those which depend upon the physical varieties of the air, there are other more irregular and transient affections of the pulmonary passages, which are usually noticed under the general account of respiratory function; we allude to the acts of coughing, sneezing, sighing, &c.; and we do not know that we can do better in this instance than extract from the instructive pages of M. Richerand. We here, as in other places, employ the translated copy, and are therefore not responsible for the occasional gallicisms that occur in our citations.

Sighing.—'When the imagination,' says Richerand, 'is strongly impressed with any object, when the vital functions are languid, the vital principle seems to forsake all the organs, to concentrate itself on those which partake most in the affections of the mind. When a lover in the midst of an agreeable reverie sighs deeply, and at intervals, a physiologist perceives in that expression of desire nothing but a long and deep inspiration, which by falling distends the lungs, enables the blood collected in the right cavities of the heart to flow readily into the left cavities of that organ. This deep inspiration, which is frequently accompanied by groans, becomes necessary, as the motions of respiration rendered progressively slower are no longer sufficient to dilate the pulmonary tissue.

Sobbing differs from sighing merely in this, that, though the expiration is long, it is interrupted, that is, divided into distinct periods.

Yawning is effected in the same manner; it is the certain sign of ennui, a disagreeable affection which, to use the expression of Brown, may be considered as debilitating or *asthenic*. The fatigued inspiratory muscles have some difficulty in dilating the chest, the contracted lungs are not easily penetrated by the blood, which stagnates in the right cavity of the heart and produces an uneasy sensation, which is put an end to by a long and deep inspiration; the admission of a considerable quantity of air is facilitated by opening the mouth widely, by the separation of both jaws. One yawns at the approach of sleep, because the agents of inspiration, being gradually debilitated, require to be roused at intervals. One is likewise apt to yawn on waking, that the muscles of the chest may be set for respiration, which is always slower and deeper during sleep. It is for the same reason that all animals yawn on waking, that the muscles may be prepared for the contractions which the motions of respiration require. The crowing of the cock, and the flapping of his wings, seem to answer the same purpose. It is in consequence of the same necessity that the numerous tribes of birds in our groves, on the rising of the sun, warble and fill the air with harmonious sounds. A poet then fancies he hears the joyous hymns by which the feathered throngs greet the return of the god of light.

While gaping lasts the perception of sounds is less distinct, the air as it enters the mouth rushes along the eustathian tubes into the tympanum, and the membrane is acted upon in a different direction. The recollection of the relief attending the deep inspiration which constitutes gaping, the recollection of the grateful sensation which follows the oppression that was felt before, involuntarily leads us to repeat this act whenever we see any one yawning.

Sneezing consists in a violent and forcible expiration, during which the air expelled with considerable rapidity strikes against the tortuous nasal passages, and occasions a remarkable noise. The irritation of the pituitary membrane determines by sympathy this truly convulsive effort of the pectoral muscles, and particularly of the diaphragm.

Coughing bears a considerable resemblance to sneezing, and differs from it only in the shorter period of duration, and the greater frequency of the expirations; and as in sneezing the air sweeps along the surface of the pituitary membrane, and clears it of the mucus which may be lying upon it, so the air when we cough carries with it the mucus contained in the bronchiæ in the trachea, and which we spit up. The violent cough at the beginning of a pulmonary catarrh, the sneezing which attends coryza, show that the functions of the animal economy are not directed by an intelligent principle, for such as are catarrhous could not mistake in such a manner the means of putting a stop to the disease, and would not call forth actions which, instead of removing the irritation and inflammation already existing, can only aggravate them.

Laughing is but a succession of very short and very frequent expirations. In hiccup the air is forcibly inspired; enters the larynx with difficulty on account of the spasmodic constriction of the glottis; is then expelled rapidly; and, striking against the side of that aperture, occasions the particular noise attending it.

Snoring, of which Richerand does not make mention, is said to be a deep, sonorous, and as it were tremulous inspiration, from the vibration of the velum palati during deep sleep, with the mouth open.

The following note is added by the editor to the page in which the physiology of the above phenomena are thus traced.

'The author has neglected to notice the state of respiration during the more active voluntary motions. Muscular exertion, especially when considerable, is preceded by a long and deep inspiration, the glottis is closed, the diaphragm and respiratory muscles of the chest are contracted, and the reaction of the abdominal muscles causes the contents of the abdomen to be pressed upon in all directions. At the same time that the respiratory muscles are exerted, those of the face are associated in the increased action in consequence of the latter receiving some nerves from the same class (see the section on the *Nervous System*), and the jaws are forcibly pressed together. By this action of the muscles engaged in respiration, the chest is rendered capacious, and the strength is greatly increased, because the trunk of the body is thus rendered immoveable in respect to its individual parts, the muscles arise from fixed points, and consequently wield the members of the body with their full energy. Haller appears to be correct in concluding that, under a state of increased action of the muscles, the flow of blood becomes greater towards the head, and thus the nervous energy is increased and amply generated by means of this augmented flow, so as to keep up the muscular action for a longer period than would otherwise be the case. During violent exertions, also, the return of blood from the brain is in some degree impeded.

The physiological state of muscular actions, as they are related to the mechanical function of respiration, is very happily described by Shakspeare, where he makes Henry V. encourage his soldiers at the siege of Harfleur:—

> Stiffen the sinews, summon up the blood.
> * * * * *
> Now set the teeth, and stretch the nostrils wide,
> Hold hard the breath, and bend up every spirit
> To his full height.

In vomiting, also, and in the action of expelling the fæces and contents of the bladder, the thoracic and abdominal muscles of respiration are brought into action.'

But, as we have above intimated, by far the most important part of respiration consists in the change effected on the blood by the action of the inspired air.

'The blood is conveyed to the lungs,' says Dr. Good, 'of a deep purple hue, faint, and exhausted by being drained in a considerable degree of its vital power, or immature and unassimilated to the nature of the system it is about to support, in consequence of its being received first from the trunk of the lacteals. We find it returned from the lungs spirited with newness of life, perfect in its elaboration, more readily disposed to coagulate, and the dead purple hue transformed into a bright scarlet. What has the blood hereby lost?' What, might our author have added, has it gained? How has this wonderful change been accomplished?

When first the Lavoiserian principles of chemistry came to be applied to the changes which the blood experiences from exposure to the oxygenous portion of the air, it was assumed, as a matter almost of physical demonstration, that blood, in its passage through the lungs, absorbed part of the oxygen of the atmosphere; that, in consequence of this absorption, the venous color was changed into arterial brightness; that, from the fixidation of an aërial substance, heat was engendered or emitted from its latent condition; and that this heat proved the perennial source of animal temperature.

When on this last subject, we shall have occasion to canvas the experiments and opinions that have been instituted and broached on the subject of animal heat, and its dependence upon or connexion with the changes that take place in the lungs by the respiratory process; we are now to limit our enquiry into the nature and extent of the change itself.

We for the most part refer our readers to the article ANATOMY for information on those points which relate to structure, confining ourselves in the present paper to function alone; but it may be right just to state in this place that 'the mucous web surrounding the air-cells of the lungs is supplied with innumerable blood vessels, divisions of the pulmonary artery, and four pulmonary veins, the branches of which accompany the ramifications of the bronchiæ, and after repeated divisions at length form au immense collection of most delicate and reticulated anastomoses. This extraordinary net-work, penetrating the mucous web on every side, closely surrounds the air cells, so that the prodigious quantity of blood existing in the pulmonary vessels is separated from the contact of the air by very fine membranes only, which Hales estimated at scarcely $\frac{1}{1000}$ of an inch in thickness.'

It is the extreme tenuity of this membrane, and its vast expansion of surface, to which we are desirous at present of calling the reader's attention. It must further be recollected that the atmosphere is composed of two aëriform fluids, seventy-nine of azotic or nitrogen gas, and twenty-one of oxygen, in 100. The atmosphere is indeed never without some very small portion of carbonic acid gas; but this is in so small quantity that it has been considered rather an adventitious ingredient than an absolutely essential one.

Now at every inspiration the quantity of the nitrogen gas is somewhat diminished, and the oxygen is partly converted into carbonic acid gas, or, as it used to be called, fixed air, proofs of which we are furnished with in the expired air, making lime water turbid, and giving other evidences with which chemical experimenters are sufficiently familiar.

That expired air, then, is very different in its constituents and qualities from that which was taken into the lungs is on all hands universally agreed; but the question is whence this difference, and how effected? Does the blood actually absorb oxygen, and is this oxygen conveyed by means of the circulation through the arteries; or does the inspired oxygen go wholly to the formation of carbonic acid in the bronchial cells?

The first doubts that were thrown out on the subject of aërial oxygenous absorption by the blood in its passage through the lungs were those which resulted from the experiments of Messrs Allen and Pepys; these gentlemen could not discover that any portion of the oxygen was absorbed in ordinary respiration, and they considered that what does disappear goes to combine with the carbon of the blood, and produce carbonic acid, the latter being equal in bulk to the oxygen that has been lost. And, subsequently to these experiments, Mr. Ellis, who has published an enquiry on the changes induced in atmospheric air by respiration, contends that there is an excretion of carbon by the pulmonary vessels; and that the inspired air, that is, the oxygenous portion of it, unites with this excreted carbon, and thus forms carbonic acid exterior to the lungs, which carbonic acid is exhaled in the expirations. Dr. Prout has been led to consider this opinion accurate, from the fact that, 'when phosphorus, dissolved in oil, is injected into the blood-vessels, vapors of phosphoric acid stream from the mouth and nostrils;' the inference from which fact is, that phosphorus is most probably excreted from the blood-vessels, and unites with the oxygenous portion of the inhaled atmosphere so as to form phosphoric acid. 'If,' says Dr. Prout, 'the phosphoric acid which is inhaled under these circumstances had been formed in the vessels themselves, it would have remained in the blood, and not have been exhaled, as it is not volatile.'

Mr. Ellis advocates his principle of the non-absorption of oxygen by the blood, and of the carbonic acid exhalation being formed in the way just adverted to, by adverting to the circumstance of seeds while germinating, and even plants themselves during growth, throwing out carbon in the form of aqueous vapor, even where no oxygen is present, this ejected carbon being a secreted matter; and it is in this way he supposes that a secretion is continually taking place on the surface of the lungs and of the skin.

'According to Mr. Ellis, we have no proof of the existence of carbonic acid, or of any aëriform fluid existing naturally in the blood, and consequently have no reason to expect that any can be thrown out; while, if oxygen enter from the air-cells into the system, it must be by absorption, or chemical affinity. If by absorption, it would in animals take the regular course of the thoracic duct, and the blood in the right ventricle of the heart would first exhibit a scarlet hue; while, in the germination of vegetables, their seeds give no evidence of possessing a structure fitted to absorb and expel uniform fluids; nor of any such fluids at any time existing in them. To the operation of chemical affinity he conceives an actual contact between the air and the blood to be requisite; but in the lungs we have an intervention of the coats of the cells and of the blood-vessels. And if these be presumed to be so thin, that when moist they will allow the air or its oxygen gas to pervade them, the gas would rather pass into the interstices of the cellular membrane than into the pulmonary vessels, and thus create an emphysema. But the whole of such permeation he holds to be gratuitous and contrary to experiments. The diminution of the bulk of respired air, he thinks, may be accounted for by a union of the carbone of the blood with the oxygen in the air cells, and the formation of aqueous vapor by the disengagement of the caloric from the oxygen of the atmospheric air.

In respect to the objection proposed by Mr. Ellis on the score of its being difficult to conceive that oxygen should permeate the membrane lining the bronchial cells, experiment has shown its fallacy and want of foundation; for it has been proved that venous blood acquires a florid color by exposure to oxygen, even when covered with a bladder, provided this bladder be moistened; and Dr. Edwards has shown that more oxygen is continually lost in the respiration of brutes than goes to the formation of carbonic acid: it has been moreover observed above that the intervening membrane between the oxygen of the atmosphere and the blood circulating through the lungs is exceedingly thin. In this particular then, as in the case of the circulation and the mechanical or physical circumstances of respiration, we feel disposed to consider that there is both truth and error in those physiologists who attribute all the effect to one source; and we should be highly gratified, did our limits permit, in presenting to our readers the view taken on this controverted subject of aërial absorption by the pulmonary blood-vessels by the able editor of Richerand's Physiology, to which, however, we refer the reader.

In respect to the change of color in the blood, from the venous to the arterial hue, we think that the fact is rather in favor than otherwise of aërial absorption; for although, as it has been properly remarked, a separation of carbon accompanies the conversion of color from the purple to the scarlet dye, yet arterial blood if enclosed in vacuo becomes purple; a proof that the mere constituents of the blood acting upon each other is a sufficient cause of the change: and Dr. Elliotson very properly adds, 'that the circumstance of venous blood remaining dark, though by the air-pump carbonic acid is evolved from it, looks rather as if the florid color were dependent upon the operation of oxygen.' Whether caloric gets admission into the blood vessels through the medium of the pulmonary circulation will be more appropriately enquired into when we are on the topic of animal temperature.

Thus have we gone to the extent of our limits in treating of the physical and chemical circumstances and changes connected with the respiratory process. It may be added that Dr. Prout has lately thrown out a suggestion that the chemical part of the function does not end in the changes effected upon the fluids in the way above traced and commented on, but that the idea of galvanic influence put into excitation by the oxidising of carbon may, if pursued, open a fruitful field of philosophising on animal functions. And every thing, we are sure, will be done by Dr. Prout that high ingenuity, active industry, and a philosophical mind can effect.

We are tempted before we go upon the subject of other purposes effected by the respiratory organisation and its appendages, viz. that of regulating the voice and speech, to present our readers with the following interesting note from Dr. Elliotson, on the length of time to which respiration may be suspended with impunity, &c. If our readers should say we do nothing but extract from others, we are very ready to plead guilty to the charge; but then it must be recollected that our professed business is merely that of collecting and collating facts and opinions: and, when we find that we cannot state these facts and announce these opinions in better language than that of the authors to whom we apply for our readers' information, it is surely better to employ their phraseology than to translate it into words of our own.

'When the air is not changed, death in general occurs long before all the oxygen is consumed through the carbonic acid which is formed, but bees, some worms, and mollusca completely deoxidise it.

Lavoisier removed the carbonic acid by potassa as quickly as it was produced, and found that a guinea pig could live in air containing but 6·66 per cent. of oxygen, and with still less become only drowsy. Dr. Edwards advances, contrary to Morozzo, that every warm-blooded animal perishes instantly when placed in air in which another has died through want of renovation, and that all of the same class among them deoxidise it equally; though in different times. This time will occasionally differ one-third, notwithstanding the size of the body and the movements of the chest be equal in them, and the carbonic acid be removed as quickly as formed. The young deoxidise it more slowly than adults; and the young if quite deprived of air die later than adults. Indeed Buffon found, and Dr. Le Gallois and Dr. Edwards have confirmed his discovery, that new-born animals of many species, as dogs and rabbits, will live a long time without air, even after they have been allowed to respire. This period lessens as the animal's temperature rises with age; and in those whose temperature at birth is high, as guinea-pigs, it is very short. They live longer than adults also in a limited quantity of air. Amphibious animals likewise live long without air.

Persons have been said to be able, by habit, to live without air a considerable time. Death generally occurs at the latest in one or two minutes when respiration is suspended; but by habit some few divers of the swimming school at Paris can remain under water three minutes. If the system is in an extraordinary state of nervous insensibility, the absence of air, like the absence of food, or the administration of strong agents, may be borne for a very long time. Even fainting renders submersion less dangerous.

Dr. E. adds, in a note on this paper, 'Some very grand instances of exaggeration on this subject will be found in an amusing and useful book entitled The Uncertainty of the Signs of Death. M. D'Egly, member of the Royal Society of Inscriptions, declares that he was engaged to a dinner for which the fish was to be provided by a Swiss diver, who obtained his living by plunging into the water and pulling the fish out of their holes. The dinner hour arrived, but no fish. Drags were employed, and the diver's body was found. The curate wished to bury it immediately, as it had been nine hours under water; but M. D'Egly determined on attempting resuscitation, and succeeded in three-quarters of an hour. The Rev. Dr. Derham, in his Physico-Theology, is more credulous than the curé; he quotes Pechlin for the case of a man pensioned by the queen for having joined this world again, after remaining upright under water, his feet sticking in the muddy bottom, for sixteen hours, at Tronningholm. Yet this is nothing; for Mr. Tibsius, the keeper of the royal library, has written an account of a woman whom he saw alive and well after being three days under water. And this is nothing; for Mr. Burmann declares he heard a funeral sermon at Bonn, in Lithuria, upon an old man of seventy, who, the preacher protested, had fallen into the water when sixteen years old, and remained under it for seven weeks. Mr. Brydone was told that one diver called Calas, but nicknamed Pesce, could live several days in the sea; and Kircher asserts that this aquatic person could walk from Sicily to Italy.'

VOICE AND SPEECH.

One particular constituting man's preeminence over the brute creation is that of his abiliity to articulate sounds, so as to convey his sentiments and ideas; for even in that tribe of animals which most nearly resemble the human in external configuration, nothing of actual articulation has ever been accomplished; and even among those animals which are taught to imitate the articulate sounds of man, the task is merely that of imitation, and does not amount to any thing approaching even to the manifestatation of intelligence. It is true that animals have a language of their own; they make one noise, as a modern author expresses it, to express joy, another terror, another to summon their young, &c., and comprehend the meaning of sounds made by us, not only of an inarticulate kind, but also articulated. In the instance of dogs Dr. Gall relates, in his work on the functions of the brain, that 'they learn to understand not merely separate words or articulate sounds, but whole sentences, expressing many ideas. I have often spoken,' he says, 'intentionally of objects which might interest my dog, taking care not to mention his name or make any intonation or gesture which might awaken his attention. He, however, showed no less pleasure or sorrow, as it might be; and indeed manifested by his behaviour that he had perfectly understood the conversation which concerned him. I had taken a bitch from Vienna to Paris; in a very short time she comprehended French as well as German, of which I satisfied myself by repeating before her whole sentences in both languages.'

Many of our readers will think these statements are stretched out into phrenological length, and that some of the dog's understanding was only understood by his master: but whether that was the case or not, certain it is that nothing like speech was ever effected by animals of the canine class, however intelligent or however instructed; and, in fact, the structure of the vocal organs is such as to preclude the power of articulate expression even supposing the presence of a mind to compass the task: but let us, after our accustomed manner, extract from one or two modern authors on the interesting subject now to be canvassed; and, first, we will bring into requisition a writer whom we always quote with extreme pleasure, on account not merely of the interest of his matter, but the elegance and grace of his language.

'The organ of the voice,' says Dr. Mason Good, 'is the larynx, its muscles, and other appendages; and the voice itself is the sound of the air propelled through and striking against the sides of the glottis, or aperture into the mouth. The shrillness or roughness of the voice depends on the internal diameter of the glottis, its elasticity, mobility, and lubricity, and the force with which the air is protruded. Speech is the modification of the voice into distinct articulations in the cavity of the glottis itself, or in that of the mouth or of the nostrils.'

There is a difficulty, however, in determining by what means the air is rendered sonorous in the glottis, and various explanations have been offered upon the subject. The oldest is that of Galen, who supposed the calibre of the glottis to be alternately expanded and contracted, an idea revived in modern times by Dodart, who at the same time compares its action to that of a flute.

A second explanation is that of M. Ferrien, who supposes the variation of sound to depend upon variations of tension and relaxation in the ligaments of the glottis, and in this view such ligaments become vibrating chords, and the entire apparatus approaches the nature of a violin. A third explanation is that of M. Richerand, who unites the two preceding conjectures, and supposes that the glottis is a wind and a chord instrument at the same time. To these explanations we may add that of Kratzenstein, who regards the glottis, in conjunction with the whole length of the larynx, as a kind of drum; and that of M. Blumenbach, who views the former in the light of an Æolian harp: all of which are ingenious sports of the imagination, but contribute little to the advance of physiological science.

Those animals only that possess lungs possess a larynx; and hence none but the first three classes in the Linnæan system, consisting of mammalia, birds, and amphibia. Even among these, however, some genera or species are entirely dumb, as the myrmecophaga or ant-eater; the manis or pangolin, and the cetaceous tribes; the tortoise, lizards, and serpents; while others lose their voice in particular regions; as the dog is said to do in some parts of America, and quails and frogs in various districts of Siberia.

It is from the greater or less degree of perfection with which the larynx is formed, in the classes of animals that possess it, that the voice is rendered more or less perfect; and it is by an introduction of superadded membranes or muscles into its general structure, or a variation in the shape, position, or elasticity of those that are most common to it, that quadrupeds and other animals are capable of making those peculiar sounds by which their different kinds are respectively characterised; and are able to neigh, bray, bark, or roar; to purr, as the cat and tiger kind; to bleat, as the sheep; or to croak as the frog; which last, however, has a sac or bag of a singular character in the throat, or cheek, directly communicating with the larynx, on which their croaking principally depends.

The larynx of the bird class is of a very peculiar kind, and admirably adapted to that sweet and varied music with which we are so often delighted in the woodlands. In reality the whole extent of the trachea in birds may be regarded as one vocal apparatus; for the larynx is divided into two sections, or may rather, perhaps, be considered as two distinct organs; the more complicated, or that in which the parts are more numerous and elaborate, being placed at the bottom of the trachea, where it diverges into two branches or bronchiæ, one for each of the lungs; and the simplex, or that in which the parts are fewer, and consists of those not included in the former, occupying its usual situation at the upper end of the trachea, which, however, is still without an epiglottis; both food and water being, as we have already observed, rendered incapable of penetrating the aperture of the glottis by another contrivance. The lungs, trachea, and larynx of birds, may therefore be regarded as forming a complete natural bag-pipe, in which the lungs constitute the pouch and supply the wind; the trachea itself the pipe; the inferior glottis the reed or mouth-pipe, which protrude the simple sounds; and the superior glottis the finger-holes, which modify the simple sound into an infinite variety of distinct tones, and at the same time give them utterance.

Here, however, as among quadrupeds, we meet with a considerable diversity in the structure of the vocal apparatus, and especially in the length and diameter of the tube or trachea, not only in the different species, but often in the different sexes of the same species, more particularly among aquatic birds. Thus the trachea is straight in the tame or dumb swan (anas olor) of both sexes; whilst in the male musical swan (anas cygnus), but not in the female, it winds into large convolutions, contained in the hollow of the sternum; in the spoonbill (platalea leucorodia), as also in the motmot pheasant (phasianus mot-mot), and some other similar windings in the trachea occur, not enclosed in the sternum. The males of the duck and merganser (anas and mergus) have at their inferior larynx a bony addition to the cavity, which contributes to strengthen their voice.

Among singing birds Mr. Hunter, who, at the request of Mr. Pennant, dissected the larynx of many distinct kinds, observes that the loudest songsters have the strongest muscles, and that the sky-lark has the strongest of the whole, whose clear and vigorous note is often heard when he can no longer be followed in his ascent by the most penetrating eye. He observes, also, that among this division of birds the muscles of the male following the same rule are stronger than those of its respective female, whose voice is always less powerful. In birds that have no natural voice he perceived no difference of muscular power in the larynx of either sex.

From this more extensive and complicated machinery, in the vocal organs of birds, we find numerous species possessing powers of a very extraordinary kind. In many of them, as the thrush and the nightingale, the natural song is exquisitely varied, and through an astonishing length of scale. In the pipra musica, or tuneful manakin, the song is not only intrinsically sweet but forms a complete octave, one note succeeding another, in ascending and measured intervals, through the whole range of its diapason. There are various kinds that are capable of imitating the music of human art, and amuse us by acquiring national and popular tunes; as the bullfinch, the linnet, and even the robin, when reared in a state of separation from all other birds; whilst some again are capable of imitating human speech, as the parrot, the jay, and jackdaw, and indeed most of the psittacus and corvus genera; a fact which proves the possession of a powerful and retentive memory, as well as of a precise and delicate ear. A linnet, acording to Mr. Pennant, was once taught the same at Kensington; and even the nightingale is said to have talents for speaking equal to those for singing. But where is the man, whose bosom burns with a single spark of the love of nature, who could for a moment consent that this sweet songster of the groves should barter away the touching wildness of its native notes for any thing that art has to bestow?

Yet, perhaps, there is no species among the class of birds that is more entitled to notice in a physiological survey, on account of its voice, than the turdus polyglottus, or mocking bird. This is a subdivision of the thrush kind; its own natural note is delightfully musical and solemn; but beyond this it possesses an instinctive talent for imitating the note of every other kind of singing bird, and even the voice of every bird of prey, so exactly as to deceive the very kinds it mocks. It is, moreover, playful enough to find amusement in the deception, and takes a pleasure in decoying smaller birds near it, by mimicking their notes, when it frightens them almost to death, or drives them away with full speed, by pouring upon them the screams of such birds of prey as they most dread.

Now it is clear that the imitative, like the natural voice, has its seat in the cartilage and other moveable powers that form the larynx; for the great body of the trachea only gives measure to the sound, and renders it more or less copious in proportion to its volume. It is not, therefore, to be wondered at that a similar sort of imitative power should be sometimes cultivated with success in the human larynx; and that we should occasionally meet with persons who, from long and dexterous practice, are able to copy the not s of almost all the singing birds of the woods, or the sounds of other animals; and even to personate the different voices of orators, and other public speakers.

One of the most extraordinary instances of this last kind consists in the art of what is called *ventriloquism*, of which no very plausible explanation has yet been offered to the world. On this obscure subject we might present some very interesting matter from the author to whom we have been principally indebted for the preceding account of the vocal organisation and function; but our limits preclude our going further into the question, and we must refer to the article VENTRILOQUISM, in the body of the work for more ample disquisition.

We have only room to add a few words on

the rationale of articulation as opposed to the mere exertion of the voice. We of course presume the necessity of more than brutal intelligence to compass articulation, but it is the quo modo of the thing itself which demands a little further enquiry in this place.

Speech has been defined a peculiar modification of the voice adjusted to the formation of the sounds of letters by the expiration of air through the mouth or nostrils, and in a great measure by the assistance of the tongue applied and struck against the neighbouring parts, the palate and front teeth in particular, and by the diversified action of the lips. Thus is it constituted by modifications which the voice is made to pass through from the motions of these assisting parts of the articulating organisation. 'The ape, in which these parts are formed as in man would speak like him, if the air in passing out of the larynx did not rush into the hyothyroid sacs, in some animals membraneous, but cartilaginous in others, and even osseous in the alouate or purr, whose howl is so hoarse and frightful. Every time the animal wishes to cry, these sacs become distended, and then emptied, so that it cannot furnish the different parts of the mouth with sounds to be articulated.'

The classification of these articulations into vowels and consonants has been generally recognised; in point of fact, however, articulated sounds are constituted by vowels, the consonants being merely for the purpose of connecting vowels together. The utterance of consonants is necessarily more forced and unnatural than that of vowels, the latter being formed by the voice, modified but not interrupted by the varied position to which we have alluded of the tongue and lips; and hence the superior harmony of those languages which have the greatest number of such letters, as in the ancient language of the Greeks, quibus dedit ore rotundo musa loqui. Hence, on the other hand, the harshness of some of the northern languages. 'It would be difficult,' says Richerand, 'to accumulate a greater number of consonants in one word (and consequently a word of more difficult pronunciation till the organs of the voice come to be used to the practice) than is found in the proper name of a German called Schmidtgen. It should be observed, however, that after the difficulties shall have been conquered of this kind of pronunciation, or when the organs may have been used to it from infancy, a much more harmonious result is effected than would à priori be conceived.

On Living Temperature, or Animal Heat.

All animals as far as can be ascertained, and even vegetables, have a tendency to preserve a temperature more or less distinct from that of the surrounding medium. Yet the difference among them in this respect is so great that they have been divided into warm and cold blooded. To the former belong the more complicated, those whose pulmonary apparatus is most elaborate; man and mammiferous quadrupeds and birds. To the second oviparous and quadrupeds, fish, and most of the intervertebrate. Birds have the highest temperature 107° to 110°, man 96° to 98½°. There is some variation, not only in individuals, but according to age, season, and climate. It is less in the young according to Dr. Edwards and Despretz; the former states the human temperature in infancy to be 94½°; the latter asserts that, while in birds it is 105° in winter, it is nearly 111° in summer, gradually increasing in spring and diminishing in autumn. In the heat to which Dr. Fordyce and his friends were exposed, the temperature of the body rose two or three degrees; and Dr. Delarade, in a vapor bath at near 120°, found the heat under his tongue increased but about five degrees at the end of seventeen minutes. In sparrows and yellow hammers Dr. Edwards found it five or six degrees higher in summer than in winter; and Dr. Davy one or two degrees higher in Ceylon than in England. In disease it will fall, and on the other hand rise; in fever it has been noted at 107°, in tetanus at 110°, and probably on tonic occasions it rises still higher, at least locally. In old age it is not so high as in the age of full vigor, nor in remote parts as in those nearer the heart. John Hunter made observations on the heat of cold blooded animals. The thermometer in the stomach and under the skin of the abdomen of the frog and toad stood at 40° when the atmosphere was 36°; in the lungs of snails at 35°, 36°, 37°, 38°, when the atmosphere was at 28°, 30°, and 34°; the heat of earth worms was 58½, when the atmosphere was 56°. Fish are not above two degrees warmer than the water. Cold blooded animals placed in an elevated temperature are much more influenced by surrounding media than the warm blooded. Yet frogs are but 80° or 82° in a medium of 110° or 115°. The heat of insects when congregated is considerable. J. Hunter found the thermometer rise to 93° or 98° in a hiv in spring, to 104° in summer, to be at 82° when the air was 40°, and at 73° in winter.

The same tendency in vegetables is shown by the greater difficulty with which the juices in their stems and branches are frozen than lifeless fluids, by ice thawing when roots shoot into it, and by snow upon the leaves or stems of plants thawing sooner than that which lies on surrounding inanimate bodies. J. Hunter observed a branch of growing fir and a bean leaf thaw the part of the surface of a freezing mixture, on which it was placed, and the fir subsequently another to which it was removed. When the sheath of the arum maculatum and cordifolium is bursting, and the cylindrical body just peeping forth, it is said by Sennælicer to be so hot for some hours as to seem burning, and twelve of them placed round the bulb of a thermometer to have raised the mercury from 79° to 143°.

Even eggs are cooled and frozen with more difficulty than equal masses of inanimate matter; although when once frozen, and their life destroyed, they freeze readily.

We are naturally led to investigate the cause of this peculiarity in an organised body; and it is not surprising that, when the chemical changes that occur in the blood while circulating through the lungs came to be applied to the explication of vital phenomena, these changes were applied also to the exposition of the perennial and independent temperature of animals.

The explanation, says a modern physiologist, of this equable and perpetual temperature is particularly simple and natural, and founded on the doctrine which makes the lungs the grand focus, and the decomposition of the oxygenised portion of the air which we breathe the fomes of our heat. For as the oxygenous part of the inspired air is decomposed in the air cells of the lungs, in such way that its base, viz. oxygen, which by its union with latent caloric was before aëriform, now separates from this caloric; it would appear that by this decomposition one portion of the caloric is rendered sensible in the bronchiæ, and the other enters in a latent form into the blood while circulating in the innumerable and delicate networks of the pulmonary vessels. This theory of course goes upon the presumption that the capacity of carbonic acid for heat being less than the capacity of oxygen, when the blood is deprived of carbonic acid by respiration, its capacity for heat becomes greater; and the simplicity and beauty of the doctrine gained it almost universal admission. Upon further enquiry and reflection, however, it was conceived that several circumstances in the living frame stood adverse to its adoption; it was said that even allowing the previous absorption of oxygen by the pulmonary vessels, the gradual and equable supply of heat to the frame could scarcely be explained upon these principles; and the alterations in interior heat without corresponding, or at least proportionate changes in the lungs, as in cases of febrile, nervous, and other states, were adduced as difficulties and impediments to the reception and application of Dr. Crawford's principles. Heat of a part too, it is known, may be increased by exercise of that part, or other circumstances which do not imply the necessity of any pulmonary change; and altogether it came to be generally understood and felt, that while much ingenuity and a certain degree or measure of truth were to be found in the hypothesis of Crawford, a good deal remained both of a positive and negative nature to invalidate the legitimacy of its inferences.

At length came Mr. Brodie's experiments, which, at their first announcement, were supposed to have thoroughly overturned the hypothetical doctrine of Crawford and others, and to have proved that the perennial temperature of animals is rather referrible to a certain condition of the brain and nerves than to the decomposition of air in the lungs. Mr. Brodie decapitated an animal, and found that he could for some time keep up the respiratory act by artificial means, and that he could thereby change the blood from venous to arterial by abstracting the carbone as completely as in the case of natural breathing; were this change then the cause of animal heat, it was natural to suppose that while the action of the heart could be preserved the temperature of the animal experimented on would be preserved also; but, instead of this, the body cooled and became of a lower and lower temperature, till the action of the heart ceased altogether. The inference, then, of Mr. Brodie, and in this inference he has been countenanced by the opinions of others, was, that the chemical theory of animal temperature is untenable.

But this inference has by others again been maintained to be fallacious, since artificial respiration never can so nearly imitate natural breathing as to be productive, throughout the frame, of the same results. In artificial respiration, it is urged, the air does not rush into the pulmonary cells, because these are in a vacuum, but is propelled into, and forcibly, and therefore injuriously, dilates them; the consequence is the formation of a large quantity of frothy mucus. 'Whether,' says the author from whom we now extract, 'the fall of temperature be owing to the evaporation of this copious secretion and its prevention of contact between the air and air-cells, or to the injurious nature of artificial respiration, still the fact ascertained by Le Gallois, viz. that, under artificial respiration, the animal may be killed even if no part be injured, destroys the conclusions which appeared deducible from Mr. Brodie's experiments. Indeed, he adds, Le Gallois found that less oxygen was consumed than in natural breathing, and that the temperature fell exactly in proportion to the smallness of the quantity of oxygen consumed; which, by the way, is contrary to the statements of Mr. Brodie. But on this controverted point we shall make room for the opinions of two able authors, Dr. Elliotson and Dr. Copland, who take somewhat different views of the subject; merely premising that a mixture of truth and error may have crept into both assumptions, and that much more both in the way of experiment and observation than we have hitherto had is requisite to satisfy the mind of the impartial enquirer.

'A host of circumstances,' says Dr. Elliotson, 'show that our temperature depends upon respiration, and, therefore, upon chemical changes.

'In high temperatures we have less necessity for the evolution of heat; in low temperatures more. Accordingly, in the former, the arterial blood remaining arterial is nearly as florid in the veins as in the arteries, and the inspired air is less vitiated; in low temperatures the venous blood is extremely dark, and the inspired air more vitiated. Some have imagined that the body remains at its standard high temperature by the refrigeration of the evaporating sweat. But, though this must contribute, it is not the sole cause; for frogs lose as much proportionably to their size by evaporation as any other animal, and yet they follow pretty closely the surrounding temperature. Whenever, on the other hand, the body itself heightens its temperature, as in fever, more oxygen is consumed by the lungs. The temperature of the various classes of animals, and their vitiation of the air, are always proportional; and inverse to the length of time they can live without air.

'The temperature of young animals is lower than that of adults, or rather they maintain a peculiar temperature much less; and they vitiate the air less; and require respiration less proportionally than adults. As they proceed to vitiate it more, and require respiration more, their calorific power increases. While their calorific powers are weak, they breathe, if they are exposed to cold, quicker, so as to keep up their temperature as much as possible. The same is also found in adult warm-blooded animals, not of the hybernating family, when exposed to cold.

'Dr. Edwards found that habit has great influence on the calorific powers of animals; that a given low artificial temperature in winter will reduce the animal heat much less than in summer, and that with the habit of evolving more heat in winter is acquired the habit of consuming and requiring more oxygen, so that animals supplied with a given quantity of air, and placed in a given warm temperature in winter, die much sooner than in summer. Yet the momentary application of heat or cold has a different effect; the former heating less if the body has been subjected to a low, and the latter cooling less if the body has been subjected to a high temperature. We all feel the cold less quickly on leaving the house in winter if well warmed first, than if we leave it already chilly.

'When animals hybernate, their temperature falls and their respiration is nearly or entirely suspended. Their consumption of air lessens as the temperature falls, whence they consume less in November than in August. If hybernating animals, while torpid and still placed in the same temperature, are stimulated mechanically to breathe, their temperature rises with the progress of respiration.

'If the cold, to which they are exposed, be so intense that it threatens death, it actually no longer depresses respiration, but for a time excites it, and their temperature rises proportionally. Man, and other non-hybernating animals, breathe more quickly when exposed to cold, no doubt, for the purpose of supplying heat, till the powers become exhausted.

'The higher the temperature of the animal the more extensive is the aggregate surface of the air cells, the more blood passes through its lungs, and the more necessary to its existence is respiration. The lungs of cold-blooded animals are not subdivided into minute cells, but formed into vesicles; and birds which have the highest temperature among animals are drowned the soonest.

'The changes of air by the blood are seen to be effected entirely by the red particles. Provost and Dumas found that the number of red particles is proportionate to the temperature.

'If the blood circulates without being first properly changed in the lungs, the temperature is below the natural standard. Those who have the blue disease are cold; and coldness is a symptom of hydrothorax, and of the repletion of the air cells with mucus in chronic bronchitis; in the former of which affections the lungs cannot fully expand, and in the latter the air is prevented from coming fully in contact with the air cells.

'In cold climates, and in temperate ones, in cold weather, animal food is desired and taken in abundance; in hot climates, and during the summer in temperate regions, light vegetable food is preferred, and the appetite less. We may conceive the former diet more calculated to support a process similar to combustion, and under the former circumstances we have seen that the changes of the air in the lungs are actually more considerable.

'The temperature of parts falls, if not maintained by a constant stream of blood from the lungs through the aorta and its ramifications, and is ceteris paribus, in exact proportion to this supply.

'Whether Crawford's theory be correct or not, the production of animal heat must be as evidently a chemical process as changes of animal temperature among inanimate bodies; yet some ascribe it to nervous energy. I cannot imagine nervous energy to cause heat any more than to cause chemical affinity: as it may bring substances together which have an affinity for each other, and thus produce their union, so it may effect those changes which are, according to physical laws, accompanied by changes of temperature; but caloric in the body must, I apprehend, like affinity, follow the same laws, and no others, as out of the body. This, however, does not prevent animal temperature from deserving the epithet vital, because it is regulated by the vital powers of the system, although through the instrumentality of chemical changes. If the high temperature of an inflamed part is owing to increased momentum, the increased sum of the quantity and velocity of its blood; yet this increased momentum is produced by vital powers.'

Here our author introduces remarks on Mr. Brodie's experiments, which, having already been referred to, need not be repeated. He then goes on to say, 'Dr. Philip has made experiments equally conclusive with those of Dr. Le Gallois against the inferences drawn by Mr. Brodie. As very little air is taken into the lungs in natural inspiration, and a regard to the bulk and frequency of each inspiration not always attended to in experiments, it is very probable that that gentleman had thrown too much air into the lungs, so that the unnatural quantity of cold air, and the augmented secretion of bronchial fluid, made the temperature fall. By impelling little, and that not frequently, Dr. Philip found that artificial respiration, after the destruction of the brain, actually retarded the cooling of the animal, while stronger respiration did actually cool the body.

'Of two rabbits killed in this way, their temperature being 104°, one was subjected to six artificial respirations, and the other to from twenty to thirty in a minute; the temperature of the former was 100° at the end of an hour, and that of the latter 98°. Of two with the temperature at 102·5° one was undisturbed, and one subjected to about thirty inspirations in a minute; the temperature of the former at the end of half an hour was 98·75°; of the latter only 98·5°. But the lungs of the latter being now inflated but about twelve times in the minute, the temperature of the former at the end of another half hour was 95·25°, and of the latter 96°. In one experiment, in which the lungs were inflated but a few times in a minute, the temperature actually rose nearly a degree by artificial respiration. Dr. Hastings at the same time made similar comparative experiments, and with similar results. In one the rabbit in which artificial breathing was performed cooled only 4°; while that which was left undisturbed cooled 7·5°.

'Dr. Philip afterwards took pairs of rabbits, killed them in the same way, and then in one experiment destroyed the brain and spinal marrow of one with a wire, while he left the other untouched; in another, precisely similar, he inflated the lungs of both. Yet in each experiment they both cooled equally. In a third the brain and spinal marrow of one only was destroyed, and the lungs of both inflated. These two cooled equally.

'The temperature of fœtuses born without brain is maintained during the few days that they may live.

'Professor Rudolphi remarks that the temperature of animals bears no proportion to their nervous system; that if it did, man should be warmer than any brute; the mammalia much more so than birds; fish much more so than insects; and birds and amphibia nearly upon a par,—all which would be the reverse of the fact.

'Vegetables have a tendency to preserve a peculiar temperature, and they have no nervous system.

'But that the nervous system affects the temperature is certain; a passion of the mind will make the stomach or the feet cold, or the whole body hot. Paralysed parts are often colder than others, or more properly are more influenced than others by all external changes of temperature. But every function is affected by the mind, though not dependent on the brain for its regular performance. And in varieties of temperature, both by the state of the mind and by paralysis, there is as far as we can judge a commensurate affection of the local circulation. Parts heated by any passion are also red, and vice versâ; and paralytic parts must have imperfect vascular functions in some measure at least from the want of the compression of the vessels by muscular action, and of the general excitement by volition; they waste and sometimes inflame or ulcerate, or slough on the slightest injury. And parts perfectly paralysed still maintain a temperature above that of the surrounding medium as well as circulation, secretion, &c., and sometimes the same as in health.

'Dr. Philip considers galvanism an important agent in the nervous system, and found that it raised the heat of fresh arterial blood 3° or 4°, and at the same time made the blood venous; a circumstance proving that the action is purely chemical—an alteration of the blood to that state in which its capacity for caloric is less.

'There is certainly no more reason to believe animal heat dependent on the nervous system than secretion, and every organic function. That like these it is influenced by the state of the nervous system is certain, but never I imagine except through the instrumentality of chemical changes.'

'We shall now contrast with these very important statements and very ingenious remarks the quotation from Dr. Copland, to which we have already alluded as containing much of interesting matter.

'The ganglionic system of nerves,' says Dr. C., 'by means of the influence derived from its principal and subordinate sources and numerous distributions, and exerted upon the vascular system, generates animal heat throughout the body, and the production of animal heat takes place in a manner analogous to the processes of nutrition and secretion. The experiments of insulating a limb, by dividing all the voluntary nerves and arteries, excepting one arterial trunk, performed by Mr. Brodie in order to ascertain the effects produced upon the generation of heat in the limb, prove this proposition, and could not fail of giving rise to what was actually observed. For the ganglial or vital nerves supplying that vessel could not be completely detached as long as any of the coats of the artery remained undivided.

'The state the nof animal heat, like other secretions, will be greatly modified by the condition, both as it respects kind and degree, of the vital influence of the ganglial system, and by the state of the blood on which this influence is exerted, which state will have a double operation in modifying the result.'

In another part the author, from whom we are now extracting, goes on to say:—

'Animal heat, however intimately related with the respiratory process, cannot be considered a function of the lungs. It must nevertheless be allowed that the changes induced on the blood during respiration are preparatory to the evolution of this heat; and although we contend that the effect is immediately the result of a manifestation of the vital influence of the ganglial system of nerves, exerted upon the blood contained in the vessels to which these nerves are distributed, yet it must be admitted that the respiratory processes are requisite to its production, inasmuch as they produce on the blood a change of properties which are requisite to excite this system; and as this fluid, when thus changed, contains the materials necessary to, or is otherwise in a suitable condition for the manifestation of, the influence which that part of this system of nerves which is distributed to the blood-vessels exerts.

'Preparatory changes thus take place in the lungs, which are necessary to the exertion of this influence, and to the evolution of heat; but, as it was contended that these changes are more of a vital than a chemical nature, so it is considered that the production of heat is more the result of the influence which the nerves of the vessels exert upon the blood, than of the change in the capacity for caloric which the blood itself experiences in its passage into the venous state. The difference of capacity which actually exists between venous and arterial blood is not sufficient, according to the experiments of Dr. Davy, to form the basis of the chemical theory formerly received; but the difference which actually does exist may be concerned in a subordinate manner in the process.

'We infer that the various causes which modify the production of animal heat, act 1. Immediately upon the organic system of nerves themselves, changing the condition of their influence; 2. Upon the blood, altering the nature and composition of this fluid, and thereby rendering it unfit for producing the requisite excitement of this system of nerves, and incapable of the changes which the influence of these nerves produces upon its constituent parts; 3. Immediately through the centro-spinal system, modifying the influence which this system imparts to the ganglial.

'These different ways in which the vital influence exerted by this system of nerves in the production of animal heat is modified might have been illustrated by experiments, and by references to facts in comparative physiology, if our limits could have admitted so great an extension of them. From what we have said, it will however, be perceived, that we view the production of animal heat more in the light of a vital secretion than of a chemical phenomenon; and that, like the other secretions and nutrition, it proceeds from and is controlled by the vital influence of the ganglial system of nerves.'

Of Secretion.

Exhalation, secretion by follicles, and secretion by glands (these glands being differently constructed in different parts of the body, according to the purposes they are to serve), it will be seen, by referring to the table of arrangements, are the several items noticed by the constructor of the table.

Secretion, we may state generally, is that process by which is separated from the blood every species of animal fluids, and indeed we might say of animal solid, because, although in a state of solution, when thrown out of their respective vessels, all parts, even the most compact of the frame, are built up as it were through the medium of the secretory process.

This function, when considered in all its bearings, is one of the most astonishing which vitality unfolds; for from precisely the same fluid, the blood, are elaborated matters both widely different from each other, and as different from the material (the blood) whence they are manufactured. Thus, what can be more unlike than the urine and the fluid from which it is furnished, or than the urine itself and other secretions? and when we attempt to explain the matter upon mechanical, or even chemical principles, we still, allowing that our premises and conclusions should be correct, remain in thorough ignorance of the power which directs to these nice combinations and results.

Secretory processes have been divided into three kinds, 1. Serous transudation, which is supposed to be effected by the termination of arterial tubes of a minute kind upon surfaces which furnish the matter thus exhaled. These terminations of vessels, however, we have already said are rather supposed than demonstrated; and some have imagined exudation through the coats of capillaries, rather than matter poured out from open mouths.

The second kind of secretory apparatus has been described by follicles, cryptæ, or lacunæ, which consist of a great number of vessels, so constructed as that an excretory duct is sent out from the congeries in the form of what an anatomist would call a vas efferens. This kind of gland is described as being found in the ear, in the tonsils, and other organs which secrete a particular kind of matter; and indeed when once we admit of conglomeration, as opposed to conglobation, we admit into the division the most complicated, as well as the least complex of the glandular organisation; so that the division might stand thus, which indeed is Blumenbach's, viz. merely, 1. Transuding vessels; 2. Secretory follicles; and 3. Those supplied with an excretory duct sent out from the congeries of vessels constituting the gland. The main objection to this division in our minds would be that transudation cannot be supposed without some converting power in the transuding pore, unless in cases where the exhalation should be merely the more tenuous part of the blood, and uniformly the same in every part.

On glandular structures, however, even without reference to the peculiarity of the matter they engender, there is much that is still obscure. We copy the following sentences on this head from Blumenbach:—

'Properly speaking, the conglomerate, as they are called, to distinguish them from the lymphatic conglobate, are the only two secretory organs; such as the salivary and lachrymal glands, the pancreas and the breasts. They are provided with an excretory duct coming immediately from the large lobes which are composed of others, smaller, and whose interior structure was once the source of warm disputes in the schools of medicine. Malpighi considered the miliary globules which are easily discovered in most glands as acini, according to his expression internally excavated. Ruysch on the contrary contended that these supposed hollow acini were nothing more than glomerules of blood-vessels, an opinion shown to be far more consistent with nature by microscopical observations, and the effect of minute injection.

'The structure of some secreting organs, especially of the liver and kidneys, the latter of which strikingly exhibit the glomerules of Ruysch or the acini of Malpighi, are not, excepting in their peculiar parenchyma, very dissimilar from this structure, and indeed throw considerable light upon the question. On the outer part of these, small twigs arise from the sides of the capillary arteries, and run into vascular glomerules, hanging from them like granules as from stalks; from these arterial glomerules spring both very minute, colorless, secreting vessels, and the radicles of veins into which the arteries are continued, and which convey back into the venous trunks the remaining blood deprived of the secreted fluid.'

It has been made a question how far the blood-vessels supplying glands should be considered merely organs of supply to those glands, or whether it is in these and from these vessels themselves that the glandular function is effected.

'The formation of the new substance within the vessels may be demonstrated,' says Mr. Hare, as quoted by Dr. Elliotson, 'by forcing colored injections into the arteries of growing bones, when the lime is seen to issue from their orifices in the form of a white powder, and deposit itself like the farina of a flower for the office of consolidation. In a similar way the injected arteries of the common domesticated hen, while her eggs are incomplete, will show the deposition of lime from their exhalant branches upon the membrane which afterwards becomes the shell.'

We have thus in some measure deviated in the present instance from our plan of excluding anatomical delineations, because in the structure of these separating manufactories, so to name them, there is a good deal that is rather conjectural, or at least disputable, than actually demonstrated; so that the composition of these parts is in some sort their physiology.

The fluids which they separate have been divided by Fourcroy into 1. The saline, as the sweat and urine; 2. The oleaginous or inflammable, as the fat, the wax of the ears, &c.; 3. The saponaceous, as bile and milk; 4. The mucous, or those which are found on the surfaces of internal membranes, that are hence called mucous tissues; 5. The albuminous, comprising the serous part of the blood; 6. The fibrous, which resides in another portion of the blood.

Dr. Bostock's arrangement, in his recently published system of physiology, is into the aqueous, as the perspiration and halitus from the lungs; the albuminous, comprising 'all the membranous or white parts of animals, the fluids of serous membranes, and those of the cellular membrane,—the former differing from the albumen of the blood chiefly in being freed from extraneous matter and coagulated, the latter from serum, chiefly in containing much less albumen; the mucous comprising the mucus of all mucous membranes, the saliva, gastric juice, tears, and semen; the gelatinous furnishing membrane and going to the formation of skin; the fibrinous, or the muscular fibres abounding in azote, and thus more completely animalised resembling the fibrin of the blood, apparently their source; the oleaginous, comprehending the fat, marrow, and secretions of sebaceous glands, and perhaps the milk, as its properties depend so considerably on oily matter; the resinous, which are similar to the former, but owe their specific character to a kind of resin; the osmazomean, an animal principle, which in all parts of the body is referred to this division; the saline or, the acids, alkalies, and neutral and earthy salts of the various solids and fluids.

On this arrangement Dr. Elliotson very properly remarks that 'it is certainly good, but, like every other arrangement of natural objects, convenient for general views and memory rather than correct. The semen is mucous, but unlike every other fluid; the gastric juice and cerebral substance are equally sui generis. Fibrous matter as well as mucous exists in semen, and is probably indeed its specific part; albumen exists abundantly in milk united into an emulsion with the oleaginous portion. The bile and urine have few properties in common, and urea is certainly not a resinous substance.

For an account of the chemical composition of these several and separate secretions we must refer to the article CHEMISTRY, and in some places to the respective words as they occur in alphabetical order. We shall terminate the present section with a few remarks on the peculiarities of the fat, the urinary secretion, and the matter of perspiration.

Fat.—Every part of the body is connected together by cellular membrane, and into some parts of this tela is deposited an oily semi-fluid substance, which, when first formed from the blood, exists in drops; but even during life it is more diffused and less concrete in some parts than in others: after death, from the cessation of vital action and from the reduction of temperature, it assumes every where the form of a concrete substance.

'There have been controversies respecting the mode of its secretion; some, as W. Hunter, contending that it is formed by peculiar glands; others that it merely transudes from arteries. Besides other arguments in favor of the latter opinion, we may urge the morbid existence of fat in parts naturally destitute of it; a fact more explicable on the supposition of diseased action of vessels than of the preternatural formation of glands. Thus it is occasionally formed in the globe of the eye; a lump of hard fat generally fills up the place of an extirpated testicle; and steatoms have been found in almost every cavity of the body.'

One of the most remarkable circumstances connected with this secretion is the rapidity with which it is occasionally formed and dissipated; in the latter case it must be reabsorbed; this is more especially the case in some constitutions than in others. You will see individuals often manifestly fatter on one day than on the preceding or succeeding day.

Hydrogen and carbon are more abundant in fat than azote, and it has hence been supposed a kind of intermedium for a portion of the nutritive matter extracted from the food, through which it must necessarily pass before it is assimilated to the individual, of which it is destined to repair the loss. Thus, it is said, that an individual with much fat is able to abstain from food longer than another without this supply, and during such abstinence the collected fat is rapidly reabsorbed. Others have supposed that fat affords a receptacle for the superfluous hydrogen of the system, which could not otherwise be easily evacuated; certain it is that it lubricates the solids and thus facilitates motion; it serves also, by filling up the angles and interstices of the body to give a roundness and smoothness to the form; hence the characteristic beauty of the infantile period. It serves also to prevent inordinate sensibility by surrounding, and thus defending, the extremities of the nerves; and it manifestly serves as a defence against cold, partly from the circumstance that animal oil is a bad conductor of caloric, and therefore preventive of the rapid transmission of heat to a cold medium. Like all the other secretions it is greatly influenced by conditions of the mind. Much fat and much anxiety are scarcely compatible.

> 'Yond' Cassius has a *lean* and hungry look;
> He *thinks* too much.'

Urinary secretion.—The composition of this fluid, as well as that of the other secretions, will be found in the article CHEMISTRY. We shall only here offer a remark or two on the mode in which it is secreted; on the manner in which it is transmitted to the bladder; retained in it and expelled from it; on the rapidity with which some matters are conveyed from other parts of the frame into the urinary organs; and on the purposes which urine, as an excretion, is supposed to answer in reference to the general economy of the animal system.

'If ever,' says Richerand, 'the art of man shall penetrate into the mystery of the intimate structure of our organs, it seems probable that the kidneys will furnish the first solution of the problem. Even coarse injections pass readily from the venal arteries into the ureters or excretory ducts of the kidneys, a convincing proof of immediate communication among the minute arteries, which, exceedingly tortuous, form with the minute veins the cortical or outward substance, and the straight urinary tubes which, distributed in conical fasciculi into the interior of these organs, constitute what has been called its tubuli and papillæ. This free communication, he goes on to say, gives an idea of the rapidity with which the blood must flow through these organs whose firm consistence allows a very moderate dilatation to the vessels.' The great difficulty, however, in this, as in other instances of secretory organs, is to find the precise point where the pabulum of secretion becomes itself actually the secreted matter; and there is nothing either in mechanism or chemistry that satisfactorily unfolds this secret. That the transmutation is gradual, in one sense, seems to be proved by the circumstance that the urine in the ureters is turbid and imperfect, and by its acquiring, as it passes along these ducts, the characteristic quality of urine. What impels it through the ureters? Partly gravity, and partly the contractility of the ureters themselves, aided, it is said, by the compression of the abdominal viscera in their alternate motions during respiration, and the concussion attending the several kinds of bodily exercise. It is questionable, however, whether these last have any power in propelling the fluid from the kidneys into the bladder. The retrograde flow of the urine, when it has once entered the bladder, is prevented by the oblique insertion of the ducts.

'The following are the causes which enable the bladder to retain the urine; the contraction of its sphincter, a muscular ring surrounding the termination of the organ into the urethra; the angle formed by the urethra after it leaves the bladder; and, lastly, the anterior fibres of the levator ani which surround the neck of that organ, surrounded beside and supported by the prostate gland.' At length the collection of the fluid in the bladder causes an uneasy sensation and urges to the discharge, which is effected both by the action of the detrusor urinæ, and abdominal pressure. In men the acceleratores are called into action, and 'Mr. Charles Bell has described two long muscles running from the back of the prostate gland to the orifice of the ureter; their action is not only to assist in emptying the bladder, but to pull down the orifice of the ureter,' so that we have another cause preventing the reflux into the ureter from the bladder, even when the last organ is repleted.

We have already alluded to the rapidity with which various substances come to affect the urinary organs, and this in truth is one of the greatest arcana in the whole animal economy. That communications between the stomach and kidneys exist by undiscovered channels has been inferred by the rapidity with which fluids disappear from the former and impregnate the latter, even when the pylorus has been tied, and thus exit prevented from this channel. It is probable that the investigations that are now being made on the subject of absorption, and its peculiarities, may tend to throw more light than hitherto has been cast on this remarkable fact: and here it may be proper to remark that the kidneys are not the only parts upon which this speedy transfer is made from one to another portion of the frame. In Dr. Cooke's recent publication on apoplexy we have an account of a man who fell down dead immediately upon taking a large quantity of gin, and of a fluid smelling like gin being found in the ventricles of the brain. In this case, if the narration be true, the transmission must have been exceedingly rapid; for it could not have taken place after death; and we have just said the fatal consequence of the liquor manifested itself almost immediately upon being swallowed.

It is not here our intention to go into pathological considerations on the venal function, and the changes of which the urine is susceptible (see URINE or UREA in the body of the work); but we have here to remark that the kidneys have been supposed the organs through which the system is freed from its superfluous azote, as the lungs and liver serve the purpose of getting rid of the refuse quantity of carbon; this inference has been drawn from the large quantity of the azotic principle which the urea of healthy urine contains. With respect to the mode in which urea is formed and separated, we may insert the following extract from Dr. Copland's note on Richerand:—'It seems not improbable that the debris of the textures, being carried into the circulation, is converted by the influence of the organs and vessels through which it flows into the substance called urea, and that the function of the kidneys is to eliminate it with other materials that would be hurtful to the system.' Dr. C. founds this opinion on the experiments of Dumas, Prevost, and Le Gallois, who found, on examining the blood of living animals whose kidneys had been extirpated, that it contained urea, the quantity of which was increased in proportion to the duration of life after the operation; whilst this substance could not be detected in the blood of those animals in which the urinary secretion was uninterrupted. It is therefore thought that urea is not formed in the kidneys by their appropriate functions, as some physiologists have conjectured; but that it, and probably other materials which are removed from the blood by these organs, are derived from other sources.

PERSPIRATION.

Much yet remains to be learned on the structure and functions of the skin. We have already seen that doubts have existed as to whether absorption is effected by the surface of the body while the outer skin remains entire; but on the power which it possesses of exudation or throwing off matter, or rather of permitting matter to pass, there can be no question. Indeed there does not seem any room to doubt that not only common perspiration, but foreign and injurious matter, may be excreted from the surface of the body, eliminated from the mass of fluids. This is exemplified, says Blumenbach, in the miasmata of exanthematic diseases, in the smell of the skin after eating garlick, musk, &c.; and, he might have added, in the elimination of gouty matter from the surface of the body, which, under certain circumstances however, is accumulated under the skin, and forms the concretions named chalk stones.

But the matter which principally and constantly finds its way through the skin is the insensible perspiration, which, according to chemical examination, is composed of various proportions of carbon, azote, and nitrogen. The sweat which is occasionally seen standing in drops on the surface of the body seems to be nothing more than this perspirable exhalation in an increased measure; its hydrogen, physiologists tell us, uniting with the oxygen of the atmosphere, and thus giving a liquid or condensed form to the secretion. Upon the same hydrogen, says Blumenbach, variously modified by the accession of other elements and constituents, would seem to depend the natural and peculiar odor perceived in the perspiration and sweat of certain nations and individuals. The quantity of matter, he goes on to say, perspired from the integuments, which in a well grown adult are equal to about fifteen square feet, cannot be accurately estimated, but is probably about two pounds in twenty-four hours. And upon this paragraph we have the following note from Dr. Elliotson:—To ascertain the quantity of watery secretion, Lavoisier and Seguin enclosed the body in a silk bag, varnished with elastic gum, and having a small opening carefully cemented around the mouth, so that, by weighing the body previously and subsequent to the experiment, they were able to ascertain exactly what had been lost; and, by subtracting from this loss the weight of the perspired contents of the bag, they also ascertained how much of this had passed off by the lungs. From repeated trials they found the mean pulmonary discharge in twenty-four hours amounted to fifteen ounces, and the cutaneous to thirty ounces. The quantity of carbon separated by the lungs ought however to be taken into the account. If it amount to eleven ounces in twenty-four hours, the quantity stated by Allen and Pepys, there will be but four ounces of pulmonary exhalation. But, if oxygen and azote are absorbed in respiration, there must have been correspondently more pulmonary exhalation, and Hales estimated it at about twenty ounces in the twenty-four hours. They found the cutaneous transpiration at its minimum during, and immediately after, meals, and at its maximum during digestion.

The minimum after digestion was found by them to be eleven grains per minute, the maximum twenty-two grains; at and immediately after dinner $10\frac{2}{10}$, and the maximum $19\frac{4}{10}$, under the most favorable and unfavorable circumstances. It was increased by liquid, but not by solid food. The pulmonary they regard as greater than the cutaneous, proportionately to the surface on which it occurs. Whatever was taken, the weight was found to become alternately as before. Indigestion lessened transpiration, and the body continued heavier generally till the fifth day, when the original weight was restored. Transpiration was less in moist air and at a low temperature, and the pulmonary and cutaneous transpirations obeyed the same laws.

These observations are sufficient to prove the importance of cutaneous transpiration, and its relation with the pulmonary exhalations; the connexion between the one and the other function has also been traced in a different way; for, as in the instance of inspiration a gas is absorbed and so heat given out, so it is said that in sweat a fluid is formed which has more capacity for heat than the blood, and hence cold is generated. Indeed the production of cold by evaporation from the surface is allowed on all hands; but something further is conceived in the particular now adverted to; and Dr. Currie has ingeniously conjectured that even in the formation of the perspirable fluid, before it makes its way to the surface, a cooling effect is produced upon the principles just adverted to; and he was led to this inference from having observed the cooling effects of immersion under some circumstances in the tepid bath, where there could be no evaporation, and consequently no generation of cold from this source.

It is possible that the laws of chemistry may have been stretched too far in the speculations which physiologists have engaged in concerning this function of cutaneous perspiration in connexion with that of respiration; but the connexion to a certain extent, and in many different ways, is sufficiently manifest, and there is a wide field open for the researches of the chemist, the physiologist, and the pathologist, for the consideration of the respiratory and the transpiratory process in relation the one to the other. We shall have to make a few remarks on this head when considering the subject of urinary affections under the article Urea or Urine, in the body of the work. But we must now proceed to consider the second order of functions marked out by Richerand, viz. those which form connexions with surrounding objects. This order, it will be perceived, comprises three genera, viz. sensations, motions, voice and speech; but on these, as well as on the second class of functions, we shall be exceedingly brief, since digestion, absorption, circulation, respiration, secretion, and nutrition, constitute the principal particulars for physiological consideration, the remainder having to do with Natural Philosophy, Natural History, or Metaphysics, and therefore falling to be considered under different divisions of the Encyclopædia. The third genus indeed of the second order we have already commented on under the head of *Respiration;* and we now pass on to a few brief remarks on *Sensations* and *Motions:*—

Sensations.

Of Light.—The rays of light passing through the cornea from any pointof an enlightened object form, as it is stated, a cone, the apex of which answers to the point of the object, and the base covers the anterior part of the cornea Those rays which do not fall upon the cornea are lost to vision—those which do are refracted by the density of the cornea, and thus turned towards the axis of the eye; when they enter the aqueous humor the refraction of the rays is less, while those which strike upon the lens through the pupil are refracted still more, because this last body has still more density. Those rays which pass upon the membrane called the iris are reflected, and show the color of the eye; the pupil, through which those rays which eventually serve for vision must pass, is contracted or dilated according to the degree of light which enters the eye, provided the retina and optic nerve, of which the retina is a sort of expansion, are in a healthy condition. When the retina is painfully affected by too powerful a light, the pupil contracts in order that admission may be only given to a small number of rays; on the other hand it widens when the light is less vivid that more light may be received upon the visual organ—the retina.

Objects are said to be inverted on the retina, and that we correct the false impression thus made by experience and the assistance of other senses, but this is a mistake; for it ought always to be recollected that it is the sensation of the image, and not the image itself, that is communicated to the sensorium; and the notion of one sense correcting another has been too vaguely taken up and reasoned upon; certain it is, however, that the child's progress in vision and general feeling is a matter partly of experience, though we believe the inferior animals are our superiors in this respect, and conceive of distances accurately immediately upon seeing the light. We not long since saw the first start of a young bird from its nest in a breeding cage: it was to a perch in the cage, and the young stranger perched as accurately upon the part aimed at as if it had had months of experience; and we are told by a celebrated naturalist of a chicken breaking from its egg and immediately obeying the dictates of its nature by darting upon and seizing a spider, that, unfortunately for itself, was crawling past at the moment of the chicken's entering upon this world of destruction.

Besides the controlling motions of the iris, which are directed by the sensibility of the optic nerve, the pigmentum nigrum serves to absorb those rays of light which are too numerous or pungent. The albinos are without this pigment, and are therefore incapable of enduring a strong light.

Light in some persons is preternaturally or morbidly short, while in others it is more than commonly long: the former defect is occasioned by the too great convexity of the cornea or prominence of the lens; in the latter there is the opposite conformation of parts. The first defect is lessened as the individual advances in life;—the second is increased by increasing years.

With respect to the external organ we may remark that the brows above the eyes in some measure direct the perspiration of the forehead from trickling into the organs, and likewise prove some defence against too strong a light. The lids too are shades or curtains to prevent the entrance of too strong a light, and to guard against the intrusion of insects or matters floating in the atmosphere; while the tears which are poured out from the lachrymal gland wash away foreign matters from the eyes, preserve their brightness, and facilitate their motions.

Of hearing.—Sound is occasioned by the vibrations excited in a sonorous body, transmitted to and through the air as an elastic medium:—it is propagated with less velocity than light. We hear the report of a gun at a distance after we have seen the flash connected with the explosion. We see lightning and then hear the rumbling of the thunder immediately after.

The human ear is so constructed, even externally, as to collect and concentrate the sonorous rays; but it is the auditory nerve, distributed among the windings of the labyrinth, that receives the impression of sound to convey them to the sensorium. On reaching the bottom of the meatus auditorius these sounds strike against the membrane which is stretched across the tympanum, the cavity of which is filled through the eustachian tube; as the vibrations of the air pass into the meatus, tremulous motions are excited in the interior, which move the malleus and stapes, 'and then institute a due relation between the organ of hearing and the sounds which strike it.' The oscillatory tremors are propagated to the vestibule, the fluid which fills the different cavities of the internal ear receives them, and thus are the branches of the auditory nerves affected, according to the nature and energy of the sounds conveyed, or the degree of integrity in which the organ itself is.

Hearing, like sight, may be peculiar; that is, the individual may be open to the perception of sounds in the one instance, and have his visual organ quite correct in the other,—and yet be without what is called a musical ear, or be unable to distinguish the different shades of color. These varied susceptibilities without any thing in the organs to explain them, have much puzzled both metaphysicians and physiologists; but the phrenologist tells you they are referrible to a particular construction of that portion of the sensorium commune which is destined to receive the perception of color and sound, and he marks out the spot of the brain, as denoted by external configuration, which is wanting in development where these faculties are wanting.

Of smell.—'The principal seat of this sense—the fungous portion of the nasal membrane, besides numerous blood-vessels remarkable for being more liable to spontaneous hæmorrhage than any others in the body, is supplied by nerves; chiefly the first pair which are distributed on both sides the septum narium, and also by two branches of the fifth pair. The former appear to be the seat of smell, the latter for the common feeling of the part that excites sneezing, &c.'

It is supposed by some physiologists that the olfactory nerves do not extend into the sinuses, and that these sinuses only improve the sense by enabling the individual to retain a larger quantity of air, and for a longer time, which is loaded with odoriferous effluvia; it is remarkable that, though the sinuses are scarcely formed at birth, the sense of smell seems sufficiently acute; which is explained upon the principle of general sensibility making up for imperfection in organs.

The disgust which the adult feels in the perception of various odors is rather perhaps referrible to the principle of association than to any actual difference of the perception itself between him and the boy. This sense is indeed very curiously the inlet to impressions both of the delightful and disagreeable kind in a remarkable degree. Rousseau very aptly called it the sense of imagination. We may instance the case of an individual turning away from the offensive breath of another, when that degree of disagreeableness would hardly be perceptible did it proceed merely from inanimate matter. Like the other senses it may be much improved by exclusive culture, and it is upon this principle that as well in this as in the instance of any other sense, the loss of one is made up by a more than ordinary acuteness in another. Blind persons can sometimes find out by the sense of smell alone how many individuals are in the room with them.

Of taste.—Each sense has been said to be but in reality a peculiar modification of feeling; of taste this may be said more appropriately than of any other sense; the surface of the tongue, which is its residence, only varying from the skin in being thinner, more vascular, its papillæ being formed in a somewhat different manner, and having cryptæ or follicles which secrete a particular mucus. The sense of taste is generally referred to the lingual branch of the fifth pair; some have supposed that the ninth pair contributes its share to its development; while others regard this last as merely supplying the organ with motive power. The papillæ of the tongue, in which the sense of taste would seem to reside, are certainly supplied from the fifth.

Of feeling and touch.—This has been with some propriety considered the elementary sense, —the generic something of which the others are modifications; indeed we perceive not only some qualities, as heat, hardness, weight, &c., by the touch only, but our knowledge obtained by other senses respecting some qualities is rendered more accurate by the touch; such qualities are figure, distance, &c. In some parts of the surface this sense is peculiarly modified; in the skin, for instance, covering the points of the fingers, here we meet with papillæ which somewhat resemble those of the tongue; but they seem constituted more of nervous projections than secreting cryptæ—they are enveloped in an extremely vascular membrane. When the sense of feeling is brought out, these papillæ are supposed to swell, and raise the epidermis away so as to render the sense more accurate. We may, however, remark that there is no part of anatomical physiology that requires more of remodelling than that connected with the integuments of the body, and this is remarkable, since one should suppose that what is so immediately under the eye would be the easiest to be understood.

The same remark on the varieties of the sense of feeling may be made, as in reference to the other senses, that it is sometimes generally perceptible, while insensible to certain impressions; and that these differences are rather ascribable to varied conditions or conformations of brain than to any difference in the organisation itself, would appear to be made out by the circumstance of apoplectic or paralytic attacks sometimes suspending or abolishing one kind of sense, while they render more acute, another. Indeed it is now, since the researches of Mr. Charles Bell, considered that the muscular fibres, rather than the mere integuments, are the parts in which these variations are actually developed.

Action of the nerves.—On this head every thing is conjectural; for whether we talk of nervous fluid as being the medium of sense, or of oscillations or vibrations, we are equally gratuitous in our assumption, and meet with difficulties at every step in our proposed analogies. That the nervous branches should have ever been supposed vibratory chords, like the strings of a musical instrument, seems astonishing when we reflect upon their form, composition, and modes of connexion; and that they are tubes, conveying a fluid from the cerebral mass, is equally inconsistent with all the phenomena connected with nervous development; this hypothesis would seem especially at variance with what has been called the reacting communication between the centre or centres of sensation, and the organs of sense. Recently the nervous influence has been considered more allied to the Galvanic impulse than any other mode of excitant; and, although vital and other impulses and agencies must be always in some measure regulated upon different principles, we cannot help thinking that more analogy has been traced between sentient excitation and the stimulus of which we speak, than had been hitherto made out.

With respect to the general rationale of sensation, the difference between sensibility and perceptibility, and the comparison of man's intelligence with the instinctive, and sensitive, and loco-motive faculties of the inferior animals; we had contemplated, in this part of our investigation, a few further intimations than those which will be found in the introductory part of the present treatise. Our limits, however, oblige us to forego our intention, which we do with the less concern, since in the article BRAIN, and under the word PHRENOLOGY, will be found, perhaps, as much of metaphysico-physiology as it is proper for us to engage in; the more abstract enquiries on the subject of mind will be found canvassed in the metaphysical articles, and the moral circumstances and responsibilities of our nature are better, perhaps, placed upon other foundations than any which physiology can supply. We shall merely content ourselves in this place by extracting what we have advanced in another publication, and reiterate 'that endeavours to establish an identity of faculty in the man and the brute (if the dispute is not a mere logomachy), have failed of their object: and as we believe that the fables of the Hamadryade are not realised in the trees of our forests; so we still flatter ourselves, notwithstanding the indications of reason, and the great power of imitation which have been exhibited by some individuals of the ape species, that the human intellect is of a nature essentially different from that of the monkey.'

We must, however, stop to fulfil an engagement which we placed ourselves under with the reader, in reference to the new division of the nervous system, which has lately been proposed and followed out with much ability by Mr. Charles Bell. The reader, by turning to the article ANATOMY, will find that under the word *Physiology* was promised an outline of these new doctrines.

Mr. Bell then takes the entire system of nerves as it is extended from or connected with the brain, including the whole length of the spinal chord. Indeed anatomists now generally speak of cranial brain and spinal brain, rather than of spinal chord, in order to do away with the old opinion, that the nerves are sent out from the brain, as the arteries are from the heart. The view at present generally taken, whether the physiologist be a convert to phrenology or not, is that the whole nervous system is in that sort of communication which is inconsistent with the former notions of origin and distribution of nerve. Mr. Bell supposes, that besides the nerves of sense, as those for vision, smell, hearing, and taste, there are four systems combined into a whole, viz. those for sensation, and those for voluntary motion, arising nearly together but in separate columns; those of respiration, and those which combine the others into a whole, and perform the vital functions. The first two arise in separate columns from the spinal chord (that is, the nerves of sensation and motion); they comprise, beside the spinal nerves generally considered such, the fifth nerves from the brain, according to the common division, and the tenth or suboccipital of some anatomists. These, our author says, are all of double origin (that is, the parts for sensation and the parts for motion are distinct at their roots), they are the nerves of muscular motion, and the general sensibility of the body's surface.

Then come the respiratory nerves of Mr. Bell's arrangement, which are principally sent off from that part which anatomists name the medulla oblongata. They are the par vagum of the eighth pair, the portio dura of the seventh, the accessory of the eighth, the phrenic or diaphragmatic, which is said to be principally formed by a branch from the second, third, and fourth, of the upper spinal nerves; and the external respiratory, having the same origin. All these Mr. Bell calls superadded or respiratory nerves, and he maintains that they are distinct from those of sense and motion; that they do not pass off like them *laterally*, and with *a double origin*; that they are not furnished with gauglia at their roots; and that they do not bestow the faculty of feeling on the parts to which they are distributed.

The nerves which unite the whole are the sympathetic of former anatomists.

Mr. Bell has thus established (provided his views be correct) a distinct system of respiratory nerves, which Dr. Philip, by the way, says ought to have been named pneumo-gastric, from their influence as well over the digestive organs as the organs of respiration). He (Mr. Bell) has also shown clearly the separate origin of the nerves of sense and motion: thus solving a problem which had hitherto puzzled anatomists, and upon which indeed not a ray of light had been thrown since the time of Galen up to the announcement of the discoveries now referred to. M. Magendie seems to wish it thought that he was the original discoverer of this last and most important distinction between nerves of sense and motion, as originating by separate roots in the spinal chord; but, whether the observations of this last very able and indefatigable physiologist were made with or without any assistance from Mr. Bell's announcement, certain it is that Mr. B. was the first to publish the fact, and therefore is justly entitled to the credit of being its discoverer. It ought however to be recollected that with respect to the former division, between brain and spine nerves, Dr. Gordon had already started objections, and that the French physiologists, even previously to Mr. Bell, had shown the connexion which the function of breathing has with that portion of the spinal chord principally in which Mr. B. has demonstrated the origin of the respiratory (pneumo-gastric) system of nerves.

OF SLEEP, DREAMING, &c.

The condition and the exciting causes of sleep demand no description; in respect to its proximate cause, or in other words the condition of the brain necessary for its induction, there is considerable obscurity. Blumenbach ascribes sleep to a diminished or impeded flow of arterial blood to the brain; for that fluid, he says, is of the highest importance, during the waking state, to the reaction of the sensorium upon the functions of the senses, and upon voluntary motions; on this opinion, his commentator, Dr Elliotson, makes the following very judicious remarks:—'The alteration of circulation is usually not the cause but the consequence; necessary, indeed, to the continuance of the altered degree of activity in the organ, but not the cause. If the circulation through a part be mechanically increased or diminished, the sensibility and activity of the part will doubtless be proportionally increased or diminished. But in ordinary sleep the diminished circulation appears only the consequence; for inactivity always follows activity.' We conceive this distinction to be important between vascular conditions as a mere circumstance and cause—a distinction which pathologists as well as physiologists would do well to recognise in some of their speculations and practice respecting nervous derangements. An exhausted or depressed nervous energy is doubtless the cause of drowsiness coming upon an individual which ends in sleep; but the altered condition of the circulation would appear to be a mere consequence, or at any rate only a concomitant.

Pressure on the brain will produce an artificial sleep, but this is a condition rather allied to apoplexy than true sleep, and no inference can be drawn from it: indeed, till we know more than we at present do, respecting the primary and directing changes in the nervous organisation, the cause of sleep must, as well as the cause of some nervous conditions, be quite obscure. We believe that if Richerand, who remarks, on the subject of somnolescence, that the human body presents, with tolerable accuracy, the model of the centripetal and centrifugal powers of ancient philosophy, the motion of several of the systems that enter into its structure is directed from the centre to the circumference; it is a true exhalation that expels the produce and continual destruction of organs; such is the action of the heart, arteries, and all secretory glands. Other actions, on the contrary, are directed from the circumference to the centre, and it is by these means that we continually receive from the aliments introduced into the digestive organs the air that penetrates into the internal structure of the lungs, and surrounds the surface of the body, the elements of its growth, and reparation. These two motions in an opposite direction continually balance each other, and alternately preponderate according to age, sex, sleep, or waking. During sleep the motions are directed from the circumference towards the centre (motus in somno intro-vergunt, Hippocrates); and, if the organs that connect our intercourse with external objects repose, the internal parts act with greater advantage.' Hence our author would explain, or rather trace, the connexion of repose with corpulence; and of inordinate mental or bodily exercise with leanness. Sleep may indeed be so indulged as to reduce man to a condition of mere brutal existence, as in a case related by the author of the above extract, viz. that of a man sleeping five-sixths of the day with a digestion always active and easy, and with moral affections circumscribed in the desire of aliment and repose.

Boerhaave also speaks of a German physician, who maintained that sleep was the natural state of man; that when he was awake he was in a state of disease, and he so acted up to his theory that he brought on apoplexy as a consequence of his inordinate indulgence.

Dreams are certainly sportings, as Blumenbach calls them, of the imagination; but as in the condition of sleep it is difficult to conceive the precise condition of the sensorial organ or organs which shall simulate the condition of wakefulness, or rather cause the consciousness of being awake, and walking, and eating, and drinking, and speaking, while the individual is actually lying upon his pillow and not making any of these supposititious exertions, unless indeed when dreaming is carried to the height of somnambulism, or walking in the sleep; here indeed the individual, like the man who is insane, reasons and even acts correctly, but without reference to other balancing and correcting principles which both actuate and restrain in the state of wakefulness or sanity. Phrenological speculators have argued with a great deal of ingenuity on these conditions, under the assumption that they imply the activity of one or more organs, while the rest are in a contrary state, and that therefore do we witness all the confusion, and irregularity, and want of restriction or restraint, which characterise dreaming and somnambulancy and madness.

Sympathies.—In respect to these it may be remarked that they exist sometimes between organs, the nervous connexion of which can be traced, and in these instances the phenomena they produce are in one sense of easy explication; but at other times they are displayed between organs which one should anatomically infer are any thing but in a state of combination: in these last instances the laws which regulate them are more obscure. What Dr. Darwin calls reverse sympathy is a curious circumstance, viz. the cessation of an irritative action in one part, being succeeded by a like action in another, and that with some degree of regularity: for instance, the skin will be covered by the eruption of measles on one day, and on the next this eruption shall be found to have prematurely subsided, and the internal membrane lining the lungs to have taken on a disordered action in consequence. Then again there is a sympathy which is in some measure inexplicable between opposite extremities of a continuous membrane, as is exemplified in the instance of ascarides in the rectum occasioning an itching of the nostrils; now why this should take place only at opposite extremities or particular points of the membrane, and not continue through its whole course, does not seem of very easy explanation. Sympathy has been applied as a term to those actions in the system which seem especially to be under the influence of final cause, if we may so say, as when the rectum contracts by the stimulus of excrement, and the sphincter ani relaxes as a consequence of that contraction.

Habit.—No one requires any illustrations of the potency of habit. Who does not know that even miscarriage is liable to recur merely from its influence, and that thousands both of natural and morbid circumstances establish themselves, as parcel of mind and body, under its entire influence. We do feel persuaded that those lessons of morality would be most efficient which should present to the mind in lively colors, and with reiterated impression, the dangerous force of this most dangerous power, when suffered to gain an ascendance under a wrong bias.

Animal motions.—Muscularity is the great organ of loco-motion, and all the modifications of it are traceable to the different manner in which muscles are attached to bones. Now 'a property common to all muscles, and the immediate consequence of their irritability, is to become shorter, more rigid, and generally unequal, and as it were angular during contraction. Prevost and Dumas assert that the muscular fibres, straight while at rest, approximate each other at intervals under contraction, so as to acquire a zigzag course and shorten the distance of their two extreme points. They ascertained satisfactorily that during contraction no increase of volume is acquired. If muscles while the fibres are straight are stretched still more, as continually happens in the muscular coats of cavities, the subsequent shrinking to the original dimension is unattended by the zigzag appearance. Nervous filaments, they also assert, go perpendicularly to the muscular fibre at the very points where the angles are formed under the zigzag contraction, and yet not to terminate there or unite with the muscular fibres, but to return or anastomoze with other nerves. The approximation of the nervous filaments to each other is thought to draw the muscular fibres into angles, and thus be the cause of muscular contraction. The approximation of the nervous filaments is considered an electric phenomenon. Electricity will effect it; and in whatever way it is effected, electric appearances are said always to be discoverable.

Muscular power is no where more displayed than in some fish. 'I have seen,' says Sir Gilbert Blane, 'the sword of a sword fish sticking in a plank, which it had penetrated from side to side; and when it is considered that the animal was then moving through a medium even a thousand times more dense than that through which a bird cleaves its course at different heights of the atmosphere, and that this was performed in the same direction with the ship, what a conception do we form of this display of muscular power. Muscular strength is proportionably much greater in smaller animals. A flea can draw from seventy to eighty times its own weight, whereas a horse cannot draw with ease more than three times its own weight.

The functions now to be considered are those in the second class of Richerand's system of arrangement; they serve for the preservation of the species, and are divided into two orders, the first of which require the concurrence of both sexes, the second exclusively belong to females. On these functions we shall, for reasons already stated, be exceedingly brief.

On the Differences of the Sexes.

During infancy we find the general characteristics of sex comparatively so indistinct that some physiologists have been disposed to refer the successive development of the male and female peculiarities solely to the generative organs. Propter solum uterum mulier est id quod est: Van Helmont. There is, however, some error in this conclusion; for we find that even from the birth some measure of difference is perceivable between the male and the female; the former having less mobility of constitution, and less delicacy and roundness of form than the latter; as the child grows this difference becomes more and more evident, the muscles of the boy become larger and firmer, the face and head more expanded, the sharpness of the bones more decided, and as youth falls into puberty the difference now is much more striking; the chest is more expanded in the male, the breasts do not as in the female become large and round, the hips are smaller in proportion to the chest, the body generally is more sinewy, and muscular, and angular; hair covers the chin, and the larynx, as marked by change of voice, is much altered. The pulse too in the male is for the most part less frequent than in the female, the stomach and appetite for food is greater, while the growth of the body is less rapid, and the several periods of dentition, puberty, and acme of stature later.

Hermaphroditism.—The sexes are sometimes, but very rarely, dubious; but the combination of the two sexes in one individual, is a mere poetical fancy, at least in the human, and in animals that bear the smallest resemblance to man. We mean the completion of the two sexes in one individual; for it certainly does appear that in a few very rare cases the organs are so formed as that the individual is neither of one sex properly, nor of the other. We saw some time since, in London, a person who was exhibited as an hermaphrodite, and it was stated that this person possessed the sexual desires and capabilities of enjoyment of both sexes, and certainly as to external form and even to genital formation there appeared a complete union of the sexes; but we are very doubtful whether the statements in reference to propensities and powers were not invented, or at least exaggerated. The mammæ in this case were beautifully formed and developed. The limbs had the round contour of the female; the voice, if we recollect right, was feminine; and the whole appearance indicated voluptuousness. But on the other hand the chin was covered with beard, there was more hair generally than is seen about the female, and it was stated that both the urine and the menses passed through a projecting body which appeared like an enlarged clitoris, only that there was the indication of an urethra and five small orifices at its under part. The question here was whether an uterus and ovaria existed; and until the death and examination of the person, this question must remain unsettled. We merely allude to the case as the most marked instance that has come within our own personal knowledge of dubious or mixed sex.

Some physiologists have traced a close analogy between the sexual organisation of the male and female, comparing the ovaria of the latter with the testicles of the former, the Fallopian tubes with the vasa deferentia, the uterus with the vesiculæ seminales, the clitoris with the penis, the nymphæ with the preputium; and to such an extent has this been carried by Sir Everard Home that he conceives the sexes are at their first formation hardly determined, but capable of passing from one into the other. These, however, seem fanciful and unstable opinions.

Genital function in man.—The generative process in man is affected by a diminution from the blood of the seminal secretion; this secretion is of a yellowish color, of a peculiar odor, of mucous viscidity, and great specific gravity; it has been found, also, to be formed of an infinite number of animalcules, which in the human semen are of an oval form, and have very fine tails; the semen, immmediately upon its secretion, passes the vasa deferentia, and enters the vesiculæ seminales; what alteration it here undergoes does not seem quite certain, or whether the vesiculæ are not merely reservoirs for it. It was stated by Richerand that they lessened the time of copulation, and that those animals, as the dog, who are without them are therefore longer in coitu; but in this be has been led into an error by too partial observation. As the semen in man passes through the prostate gland it is mixed with the mucus which this gland secretes, and is projected through the uterus with it. 'The emission of semen is excited by an abundance in the vesicles, and by sexual instinct; it is effected by the violent tentigo which obstructs the course of the urine, and, as it were, throws the way open for the semen; by a kind of spasmodic constriction of the vesiculæ seminales; by a convulsion of the levatores ani and of the acceleratores urinæ; and by a succussion of the whole system, short and less violent, though almost of an epileptic nature, and followed by a depression of strength.'

Genital function in the female.—The question of how far the semen is propelled into the genital organs of the female does not seem to be quite settled; and, indeed, there still remains some difference of opinion, as to the part which the female performs in the process of generation. It was formerly thought that the ovaria secreted a seminal fluid, which mixing with the male semen in the uterus, impregnation was the result of the union; that notion is now, however, pretty generally abandoned, but it is still supposed that the ovarium prepares something essential to generation, since its removal renders the female sterile. Some imagine that an actual contact of the ovum and semen is necessary, and it is imagined that the semen is absorbed into the uterus, where it is met by the ovum which has descended through the Fallopian tubes. It is even supposed by some physiologists that an actual absorption of the semen from the vagina to the ovum takes place; in confirmation of this opinion, Dr. Gartner of Copenhagen discovered a passage leading from the ovarium to the vagina. Dr Blundell, who has given his attention much to this subject, supposes that a sort of peristaltic motion is performed by the vagina and womb, occasioned by the stimulus of the semen, and that by this action the semen is conveyed to the rudiments: it is his opinion that the aura seminalis is not sufficient for impregnation, but that the semen of the male must come in contact with the rudiments. This is a return to the old doctrine of impregnation before the time of Harvey, and is most probably the correct one.

A question remains respecting the bursting of the Graffian vesicles, whether this is effected merely by the influence of the semen or from the mere excitation connected with the venereal act, the semen only then impregnating the contents of the vesicles when they shall have escaped from the ovaries. There seems some difficulty in determining this point, but at any rate it is pretty generally understood that these vesicles may burst and their contents be discharged without actual impregnation; so that corpora lutea, or the remaining yellow bodies after the rupture of the vesicles, are not properly regarded as the test of impregnation.

In what manner the semen operates upon the ovarian secretion, so as to fecundate, seems beyond human power to divine. The ingenuity of man has not, however, been idle on this recondite subject, and the most fanciful and absurd speculations have been put forth as solutions of the question. It has been supposed that the animalculæ of which the semen is constituted pass in a current through the Fallopian tubes to the ovaria, where they enter into a violent contest—that all are killed except one, which, being left champion in the field of battle, penetrates into the ovarium destined to receive it. According to the hypothesis of M. Buffon, every part of the body furnishes its appropriate moleculæ to compose the semen, 'and these atoms coming from the eyes, ears, &c., of the man and woman, arrange themselves round the internal mould, the existence of which he admits, believing it to form the base of the edifice, and to arise from the male if it should be a boy, and from the female if a girl.

It has been properly remarked, upon this wild and fanciful hypothesis, that, were it necessary to offer any objection to it, the fact that infants are often born perfectly organised, the parents of whom had some defect in structure, would be sufficient to refute it.

For the other particulars mentioned in this part of the classification we refer to the article Midwifery.

Of Ages and Temperaments.

An infant is born but with a very imperfectly formed epidermis, hence its general redness of appearance; this, however, is soon developed upon the surface, the redness and roughness of the skin disappear, the down which covered the face falls off, and the wrinkles are effaced. For the first month or two the child seems to require nothing but nourishment and sleep; it at length, and gradually, becomes accustomed to the impression of exterior objects, as well as to its own internal sensations, and the gradual development of the understanding is exceedingly interesting. 'Towards the middle of the second month it becomes capable of agreeable sensations. If it feels them before that time, at least, it is only then that it begins to express them by laughing.'

Teething.—This process commences with some degree of irregularity; but it is generally believed that in the seventh or eighth month the teeth begin to show themselves, and the following order, with some deviation, is observed; the middle incisions first appear in the upper gums, then the corresponding under incisions, then the lateral incisions of the upper jaw, followed by the lower, and the cuspidate appear in the same order. It is not, in general, till towards the second year that the molar teeth make their appearance, and these come out in the reverse order, those of the inferior jaw appearing first. The teeth, are now twenty in number; at the end of the fourth year, two new grinders are added in each jaw. These last during life, while the first, or milk teeth, as they are called, are shed in the same order in which they appear, and new teeth better formed and larger, take their place. This last change takes place when the child is seven years old. About the ninth year two large grinders make their appearance beyond the others, and the dentition is now complete with twenty-eight teeth. It is usually after the age of eighteen, and sometimes later, that the dentes sapientiæ, two in each jaw, present themselves.

This double range of teeth actually exists in the jaw of the fœtus. "Each alveolar process contains two membranous follicles, lying one over the other. That which is to form the primitive tooth swells the first, a calcareous matter covers its surface and forms the body of the tooth, which invades also the follicle by which the osseous part is secreted; so that, the growth of the little bone being completed, the membranous vesicle, in the parietes of which the dental vessels and nerves branch out, is found in the centre of its body, and adheres to the parietes of its internal cavitiy. It is difficult to say why the growth of the dental germs is successive; why in the seventh year the primitive teeth are detached and are replaced by others which have remained so long buried within the alveolar processes. Dentition is like all other phenomena of the living economy; it is subject to endless varieties in its period, duration, &c. Thus teeth of a third set have been known to be cut in very old people. There are instances, but they are very scarce, of children that have come into the world with two incisores in the upper jaw.'—Richerand.

For an account of the process of ossification in general see the article BONE.

Puberty.—In this country the season of puberty is scarcely ever sooner than the fifteenth year, and often much later, if the constitution is not very forward. Its principal marks are, as we have above noticed, the change of voice, arising from laryngial changes and a sudden dilatation in the aperture of the glottis. In females the change is mainly marked by the appearance of the menstrual discharge, and by the enlargement of the breasts, 'neque enim vox mutatur, neque barba venit.'

Manhood.—The twenty-first year is legally marked as the period of manhood. 'It may be considered,' says Richerand in his excellent treatise on physiology, 'as beginning from the twenty-first to the twenty-fifth year. Then all increase of the body in height is at an end; the processes are completely united to the body of the bones: but still growth goes on in other dimensions. All the organs acquire remarkable hardness, solidity, and consistency. It is the same with the intellectual and moral faculties. To the empire of imagination succeeds that of judgment, that is capable of fulfilling all the duties of family and society. This period of life, to which we give the name of mature age, extends to the fiftieth or fifty-fifth year for men; it scarcely goes beyond the forty-fifth for women, with whom it begins also a little sooner. During this long interval men enjoy the whole plenitude of their existence.'

TEMPERAMENT.

On this head we give the following extract from Dr. Uwins's work on diseases connected with indigestion.

'It would seem natural enough to suppose that an individual from birth might be endowed with more or less of vigor, not merely of constitution generally, but in one or other of the media, so to say, of vital causation; and such we find the fact.

One person, without being generally feeble, will prove from his cradle to his grave to be what is called nervous; that is he may be firmly made and accoutred by nature, so far as the mere ground work of the machinery goes; he may have a bone compact in its structure and large in its dimension; he may possess a muscle that shall forcibly contract in obedience to the mandates of the will; he may be furnished with blood-vessels ready and able to act with freedom and facility under the order of the circulating impulse; an absorbent energy prepared to take up the nutritive, and an excernent power to throw off effete matter;—and yet shall be in one sense or in one particular a weakly individual; that is, the organs which are destined by nature to receive and transmit sentient impressions shall be so constructed as to run rapidly into a disordered state from the slightest source of irritation; to be morbidly acute at one time, unduly torpid at another, and never in that condition of tone or strength which is consistent with a firm or regular performance of function.

In another individual we shall find the circulation of the blood to be that function which shall be most easily pushed into a deranged condition by disease, creating impulse. His feeling is by no means morbidly acute; his lymphatic organisation and absorbent energy are so adjusted to the requisites of the frame that he has no tendency to glandular ailment, no readiness to be affected through any portion of the secretory or excretory system, and yet expose him to sources of irritation, and you will find the result manifest itself in partial or general disorder of blood-vessels; hæmorrhages will easily occur; inflammation will be prompt to establish itself; the individual is of a sanguine temperament.

The lymphatics of a third individual are the parts upon which disorder most readily fixes. In this instance the perfective organisation may be developed with a due regard to healthy proportion; the blood-vessels, when once supplied with their material of circulation, may circulate freely; the brain and the heart, the centre and sources of the perceptive and vascular impetus, may be both in the best condition of susceptibility; and yet the supplying and discharging portion of the frame shall be so feeble in its structure, and so morbid in its excitability, as to be constantly obnoxious to disease. In this case that kind of constitution exists which is vulgarly called scrofulous, and which, notwithstanding all our recent refinements in phraseology, in spite of all our attempts to generalise and simplify, cannot but be received as consisting in 'a particular condition of the lymphatic system.'

'In the above sketch,' continues the author from whom we extract, 'we must enter our protest against a desire of being understood as precise and determinate. The divisions, after all, are in one sense ideal; and we find in nature no prototype of absolutely unmixed constitution. The lymphatic falls in with the sanguine, the nervous with the lymphatic, the sanguine with the nervous, in such sort that you can never predicate any thing beyond apparent predominance and frequently hardly that. The ancient doctrine of temperament was objectionable because it did not sufficiently recognise these endless mixtures, and because it assumed the existence of a something tangible—a materies, upon which the difference in constitution is founded. We actually know nothing beyond the fact of varied susceptibility; we are still ignorant of the cause upon which the variety depends.'

VARIETIES OF THE HUMAN SPECIES.

Richerand follows Lacépède in making four principal varieties of the human species:—The European Arab, the Mogul, the Negro, and the Hyperborean. 'We might add,' he says, 'a fifth, the American, were it not most probable that the new continent is peopled by inhabitants who, coming from the old either by land in the austral hemisphere, or along the immense archipelago of the Pacific Ocean, have been altered by the influence of that climate, and the yet virgin soil, so that they are to be regarded less as a distinct race than a simple variety.'

Cuvier's division is into, 1. The Caucasian; 2. The Mongolian; 3. The Negro; while Blumenbach's, which we believe to be the most generally approved, is into five varieties:—The Caucasian, Mongolian, Ethiopian, American, and Malay. We cannot but avail ourselves here of the very interesting account given by Dr. Elliotson of these varieties.

1. *The Caucasian.*—The skin white; the cheeks red,—almost a peculiarity of this variety; the hair of a nut-brown, running on the one hand into yellow, and on the other into black, soft, long, and undulating. The head extremely symmetrical, rather globular; the forehead moderately expanded; the cheek bones narrow, not prominent, directed downwards from the malar process of the superior maxillary bone; the alveolar edge round; the front teeth of each jaw placed perpendicularly. The face oval, and pretty straight; its parts moderately distinct, the nose narrow and slightly aquiline, or at least its dorsum rather prominent; the mouth small; the lips, especially the lower, gently turned out; the chin full and round:—in short the countenance of that style which we consider the most beautiful.

This comprehends all Europeans except the Laplanders and the rest of the Finnish race; the western Asiatics as far as the Obi, the Caspian, and the Ganges; and the people of the North of Africa.

2. *The Mongolian.*—The skin of an olive color; the hair black, stiff, straight, and sparing. The head almost square; the cheek bones prominent outwards; the space between the eyebrows, together with the bones of the nose, placed nearly in the same horizontal plane with the malar bones; the superciliary arches scarcely perceptible; the osseous nostrils narrow; the fossa maxillaris shallow; the alveolar edge arched obtusely forwards; the chin somewhat projecting. The face broad and flattened, and its parts consequently less distinct; the space between the eyebrows very broad as well as flat; the cheeks not only projecting outward, but nearly globular; the aperture of the eye-lids narrow,—linear; the nose small and flat.

This comprehends the remaining Asiatics, except the Malays of the extremity of the Trans-gangetic peninsula; the Finnish races of the North of Europe,—Laplanders, &c.; and the Esquimaux diffused over the most northern parts of America, from Behring's Strait to the farthest habitable spot of Greenland.

3. *Ethiopian.*—The skin black; the hair black and crisp. The head narrow, compressed laterally; the forehead arched; the malar bones projecting forwards; the osseous nares large; the malar fossa behind the infra-orbitar foramen deep; the jaws lengthened forwards; the alveolar edge narrow, elongated, more elliptical; the upper front teeth obliquely prominent; the lower jaw large and strong; the cranium usually thick and heavy. The face narrow, and projecting at its lower part; the eyes prominent; the nose thick and confused with the projecting cheeks; the lips, especially the upper, thick; the chin somewhat receding. The legs in many instances bowed.

This comprehends the inhabitants of Africa; with the exception of those in the northern parts, already included in the Caucasian variety.

4. *The American.*—The skin of a copper color; the hair black, stiff, straight, and sparing. The forehead short; the cheek bones broad, but more arched and rounded than in the Mongolian variety, not, as in it, angular and projecting outwards; the orbits generally deep; the forehead and vertex frequently deformed by art; the cranium usually light. The face broad, with prominent cheeks, not flattened, but with every part distinctly marked if viewed in profile; the eyes deep; the nose rather flat, but still prominent.

This comprehends all the Americans excepting the Esquimaux.

5. *The Malay.*—The skin tawny; the hair black, soft, curled, thick, and abundant. The head rather narrow; the forehead slightly arched; the parietal bones prominent; the cheek-bones not prominent; the upper jaw rather projecting. The face prominent at its lower part; not so narrow as in the Ethiopian variety, but the features, viewed in profile, more distinct; the nose full, broad, bottled at its point; the mouth large. This comprehends the inhabitants of the Pacific Ocean, of the Marian, Philippine, Molucca, and Sunda Isles, and of the peninsula of Malacca.

General remarks.—The color of the hair thus appears somewhat connected with that of the skin, and the color of the iris is closely connected with that of the hair. Light hair is common with the white and thin skin only, and a dark thick skin is usually accompanied by black hair; if the skin happens to be variegated, the hair also is variegated; with the cream-white skin of the albino we find hair of a peculiar yellowish white tint; and, where the skin is marked by reddish freckles, the hair is red. When the hair is light the iris is usually blue; when dark it is of a brownish black; if the hair loses the light shade of infancy, the iris likewise grows darker, and, when the hair turns gray in advanced life, the iris loses much of its former color; the albino has no more coloring matter in his choroid or iris than in his skin, and they therefore allow the redness of their blood to appear, the latter being of a pale rose-color and semi-pellucid, the former, from its greater vascularity, causing the pupil to be intensely red; those animals only whose skin is subject to varieties vary in the color of the iris; and, if the hair and skin happen to be variegated, the iris is observed likewise variegated.

The Caucasian variety of head, nearly round, is the mean of the rest, while the Mongolian, almost square, forms one extreme, having the American intermediate, and Ethiopian the other extreme, having the Malay intermediate between it and the Caucasian.

The Caucasian variety of face is also the mean, while the Mongolian and American, extended laterally, form one extreme, and the Ethiopian and Malay, extended inferiorly, constitute the other. In the first of each extreme, viz. the

Mongolian and Ethiopian, the features are distinct, while in the second, viz. the American and Malay, they are somewhat blended.

Although this division of mankind is well founded and extremely useful, it is liable, like every artificial division of natural objects, to many exceptions. Individuals belonging to one variety are not unfrequently observed with some of the characteristics of another; the characteristics of two varieties are often intimately blended in the same individual (indeed all the four varieties run into each other by insensible degrees); and instances continually occur of deviation in one or more particulars from the appearances characteristic of any variety: so that the assemblage rather than individual marks must frequently be employed to determine the variety.

Particular remarks.—The Caucasian variety is pre-eminent in all those mental and corporeal particulars which distinguish man from brutes. It is to the two sexes of this variety that Milton's lines apply:—

> For contemplation he and valor formed;
> For softness she and sweet attractive grace.

The cranium is very capacious, the area of the face bears to its area but a proportion of one to four, and projects little or not at all at the lower parts: the intellectual faculties of its individuals are susceptible of the highest cultivation, while the senses of smelling, hearing, and seeing, are much less acute than in dark nations. Philosophy and the fine arts flourish in it as in their proper soil.

The Ethiopian variety, when instructed by the Caucasian, has produced instances of mental advancement great indeed, but inferior to what the latter is capable of attaining. 'There scarcely ever,' says Hume, 'was a civilised nation of that complexion, nor even an individual, eminent either in action or speculation. No ingenious manufactures amongst them, no arts, no sciences. On the other hand, the most rude and barbarous of the whites, such as the ancient Germans, the present Tartars, have still something eminent about them, in their valor, form of government, or some other particulars.' Blumenbach, however, possesses English, Dutch, and Latin poetry written by different negroes, and informs us that, among other examples of distinguished negroes, a native of Guinea, eminent for his integrity, talents, and learning, took the degree of doctor in philosophy at the university of Wittemberg, and that Lislet, of the isle of France, was chosen a corresponding member of the French Academy of Sciences. 'Provinces of Europe,' says he, 'might be named, in which it would be no easy matter to discover such good writers, poets, philosophers, and correspondents of the French Academy; and, on the other hand, 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 than the negro to the polished nations of the globe.' This mental inferiority is attended of course by a corresponding inferiority of the brain. The circumference, diameters, and vertical arch of the cranium, being smaller than in the European, and the forehead particularly being narrower and falling back in a more arched form, the brain in general, and particularly those parts which are the organs of intellect, properly so called, must be of inferior size. The orbits, on the contrary, and the olfactory and gustatory, or, rather, masticatory, organs being more amply evolved, the area of the face bears a greater proportion to the area of the scull,—as 1·2 to 4·; the proportion is greater in the orang-outang, and in the carnivora nearly equal. The senses here situated, as well as that of hearing, are astonishingly acute, though not only in this, but also in the three following varieties, and the corresponding nerves, at least the first, fifth, and facial, of great size.

The ossa nasi lie so flatly as to form scarcely any ridge; the face, as we have formerly seen, projects considerably at its lower part; the lower jaw is not only long but extremely strong; the chin not only not prominent but even receding, and the space between it and the lower teeth is small, while that between the upper teeth and the nose is large; the meatus auditorius is nearer the occiput,—more remote from the front teeth than in the European; the foramen magnum occipitale lying farther back, the occiput is nearly in a line with the spine; the body is slender, especially in the loins and pelvis, whose cavity likewise is small; the length of the fore-arms and fingers bears a large proportion to that of the os humeri; the os femoris and tibia are more convex, and the edge of the latter, according to a remark of the late Mr. Fyfe of Edinburgh, very sharp; the calves are placed high; the os calcis, instead of forming an arch, is on a line with the other bones of the foot, which is of great breadth; the toes are long; the penis large and frequently destitute of frænum. Mr. White, from whom many of these remarks are derived, describes the testes and scrotum as small. Mr. Billmann of Cassell has observed that the stomach is shorter, more globular at its cardiac extremity; and the observation is confirmed by Soemmerring, who finds that of the ape still shorter; the skin is thicker, and, finally, the term of life generally shorter, than in Europeans.

Nearly all these facts demonstrate rather a less distance of the negro than of the European from the brute creation. But with an inferiority to the Caucasians so slight, if compared with his immense superiority over the most intelligent brutes, so incessantly running into the Caucasian and all the other varieties, so liable to innumerable diversities of conformation as well as bearing some resemblance to brutes, and so certainly bearing no more resemblance to them in some points nor so much in others as many tribes of other varieties, the poor negro might justly class those of us who philosophically view him as merely a better sort of monkey, or who desire to traffic in his blood, not only below himself, but below apes in intellect and below tigers in feeling and propensity.

> Indica tigris agit rabida cum tigride pacem
> Perpetuam. Savis inter se convenit ursis.

'The unconscious admiration which that traveller detected himself in bestowing upon the native beauties affords,' says the writer of a critique of major Denham's Travels in Africa, 'one more example of this truth, that, however much Europeans have doubted whether negroes were men, there has never been a difference of opinion as to whether negresses were women.'

'The skin of the negro has a peculiar velvet-like softness, and is lubricated by an oily secretion. The Malays have but little hair upon the chin, and possess a great development of the parts of the head above the ears. The Mongolians are remarkably square and robust; their shoulders high, their extremities short and thick. The Americans have small hands and feet, and are nearly destitute of beard. Shorter in the forehead than the Mongolians, they have not so great intellectual distinction.

Not only have the five varieties their distinctive characteristics, but the different nations comprehended in each variety have each their peculiarities, both mental and corporeal: among the Caucasian, for example, the Germans, French, Spaniards, and English, are extremely different from each other. Nay the provinces of the same country differ, and the families of the same province: and, in fact, every individual has his own peculiar countenance, figure, constitution, form of body and mental character.

After this interesting commentary on the classification of Blumenbach, Dr. Elliotson proceeds by saying, 'a question here presents itslf: are the differences among mankind to be ascribed to the influence of various causes upon the descendants of two, or of more, but all similar, primary parents, or to original differences in more than two primary parents?'

He decides in favor of the opinion that 'we are all brothers,' or originate from one common parentage, first from the general simplicity of nature's laws; secondly from analogical facts leading to the conclusion that none of the differences of mankind are so great as to require the belief of their originality; and, thirdly, direct facts, he says, harmonise with this conclusion. All races run insensibly one into another, and therefore innumerable intermediate examples occur when the distinction between two varieties is lost.

He illustrates these positions by an appeal to a vast number of historical facts; by a consideration of the immense influence of time, place, and circumstance; and by reasonings and inferences taken from natural history, which it would give us pleasure to follow were we permitted by our limits. His conclusion from the whole survey is stated in the following words:—

'On account of all these facts, and of the consideration that a child is continually produced differing remarkably from both its parents, and that such an individual, born in ancient times, might have given origin to a large nation resembling himself, I can discover no reasons for not believing that we all sprung from two parents.'

PHYS'Y, *n. s.* The same with fusee. See FUSEE.

Some watches are made with four wheels, some have strings and *physies*, and others none. *Locke.*

PHYTIV'OROUS, *adj.* Gr. φυτον, and *voro*, to devour. That eats grass or any vegetable.

Hairy animals, with only two large foreteeth, are all *phytivorous*, and called the hare-kind. *Ray.*

PHYTOLACCA, pokeweed, or American nightshade, in botany, a genus of the decagynia order and decandria class of plants; natural order fifty-fourth, miscellaneæ. It grows naturally in Virginia, and has a thick, fleshy, perennial root, divided into several parts as large as middling parsnips. From this rise many purple herbaceous stalks, about an inch thick, and six or seven feet long, which break into many branches, irregularly set with large, oval, sharp-pointed leaves, supported on short foot-stalks. These, at first, are of a fresh green color. But as they grow old they turn reddish. At the joints and divisions of the branches come forth long bunches of small bluish-colored flowers, consisting of five concave petals each, surrounding ten stamina and ten styles. These are succeeded by round depressed berries, having ten cells, each containing a single smooth seed. In Virginia and other parts of America the inhabitants boil the leaves, and eat them in the manner of spinach. They are said to have an anodyne quality; and the juice of the root is violently cathartic. The stems, when boiled, are as good as asparagus. The Portuguese had formerly a trick of mixing the juice of the berries with their red wines, to give them a deeper color; but as it was found to debase the flavor, and to make the wine deleterious, the king of Portugal ordered all the stems to be cut down yearly before they produced flowers, to prevent any further adulteration. The same practice was common in France till it was prohibited by an edict of Louis XV. and Louis XVI. under pain of death. This plant has been said to cure cancers.

PHYTON, a general of the people of Rhegium, against Dionysius, the tyrant of Sicily. He was taken by the enemy, and tortured, and his son was thrown into the sea; A.A.C. 387. See SYRACUSE.

PHYXIUM, an ancient town of Elis.

PIA, or PIALIA, festivals instituted in honor of Adrian, by the emperor Antoninus Pius. They were celebrated at Puteoli on the second year of the Olympiads.

PIABA, in ichthyology, is a small fresh-water fish, caught in the rivers and brooks in the Brasils, and in some other parts of America. It is about the bigness of the common minnow; is well tasted and much esteemed by the natives.

PIABUCU, in ichthyology, an American fish, eaten in many places by the natives. It is said to be very ravenous and greedy of blood. It seldom exceeds four inches in length.

PIACENZA, or PLACENTIA, a gloomy town of the north of Italy and duchy of Parma, situated in an extensive plain, near the right bank of the Po, not far from its junction with the Trebia. It is surrounded by earthen ramparts, and defended by a castle. Of its streets, a few are broad and straight, but most of them are narrow and winding; the most spacious is the Stradona; but it has the appearance of a road, being bordered with gardens and a dead wall. The palazza publico is in the only square of consequence. In another is situated the ducal palace, a building of considerable extent, but of little architectural merit; and the cathedral, remarkable only for its heaviness and bad taste. It contains, however, a number of fine paintings. The theatre is neat and commodious. Here is also a university of no great note; but the town library contains 30,000 volumes; and there are several extensive private collections. Piacenza is a place of little activity; it has, however, manufactures of silk stuffs, woollen, fustian, stockings, and hats; also a great yearly fair held in April. It was the birthplace of pope Gregory X. and of cardinal Alberoni. In June, 1799, the French were defeated in the neighbourhood, in a very sanguinary conflict with Suwarrow. Population 20,000. Thirty-two miles W.N.W. of Parma, and thirty-four south-east of Milan.

PIACENZA, or the PIACENTINO, a duchy of Italy, in the Parma States, extending from the Appennines to the Po. It is about thirty-six miles in length from north to south, and from ten to eighteen in breadth from east to west. It is a fertile tract, producing corn, wine, oil, silk, and chestnuts. The hilly part contains mines of iron, copper, and vitriol.

PI'ACLE, *n. s.*
PIAC'ULAR, *adj.*
PIAC'ULOUS.
} Lat. *piaculum, piacularis.* A crime; expiatory; having the power to atone; such as requires expiation.

When the profession (Pharisaism) began no history recordeth. Some would fain fetch them from Isa. lxv. 5. But these strain too far; for, in the verse before, the same men eat swines' flesh which to the Pharisees is more than *piacular*. *Bp. Hall.*

To tear the paps that gave them suck, can there be a greater *piacle* against nature, can there be a more execrable and horrid thing? *Howel.*

While we think it so *piaculous* to go beyond the ancients, we must necessarily come short of genuine antiquity and truth. *Glanville.*

It was *piaculous* unto the Romans to pare their nails upon the nundinæ, observed every ninth day. *Browne.*

PIA MATER, Latin. A thin and delicate membrane, which lies under the dura mater, and covers immediately the substance of the brain. See ANATOMY, Index.

PIANISSIMO, in music, very soft.

PIANKASHAWS, a nation of North American Indians, who resided formerly in the North Western Territory, on the banks of the Wabash.

PIANO, Italian, in music, softly.

PIANO-FORTE, Italian. A pleasing stringed and keyed instrument of English origin, being invented by our poet Mason, the author of Caractacus: it received its name from its varied command, within certain limits, both of softness and strength. The chief beauty of this instrument, and which indeed constitutes its principal advantage over the harpsichord, is its capacity of obeying the touch, so as to enable the performer to vary and accommodate the expression to all those delicacies, energies, and striking lights and shades which so greatly characterise the more refined compositions of modern times. The piano-forte, though of recent invention, has received from the hands both of Englishmen and foreigners many useful and valuable improvements; and in that state in which it assumes the name of grand piano-forte, and is furnished with its additional keys, is not only qualified to give brilliancy of effect to sonatas, concertos, and all pieces of extraordinary execution, but forms an expressive accompaniment to the voice, and is one of the noblest and most elegant instruments in the whole compass of musical practice.

PIAR, a recent black general of the independents of Venezuela, Colombia. When Bolivar, on his landing at Ocumare, marched on Caraccas, he confided to Piar a body of infantry, and, when the former was repulsed, Piar managed to retreat with great skill, and afterwards beat the enemy several times. He was the idol of the soldiers, until he aspired to the supreme rank. To arrive at this it was necessary to sacrifice the whites and Bolivar. His scheme was, however, happily discovered, and, being arrested, he was tried by a court martial, and sentenced to be shot. Bolivar made some vain efforts to save him, but was obliged to sign his death warrant. He fell with bravery, pierced with seven balls, at the gates of Angustura. His projects were soon forgotten, but his military feats are still celebrated by the Colombians.

PIAS, or BIAS, a town of Asiatic Turkey, on the site of the ancient Issus. It was not many years ago a warlike and populous town, the residence of a chief, who rebelled against the grand seignior, and laid the neighbouring districts under contribution, till the Porte, irritated by his depredations, fitted out an expedition, which took this place and reduced it to ruins.

PIASTUS, or PIAST, a native of Poland, the son of Cossisco, or Kossiusko, a citizen of Cruswitz, who, from the station of a wheelwright, was raised to the throne of the duchy or kingdom of Poland, about A.D. 830, on the death of Popiel II. Different fabulous legends are told by the canon of Cracow, Guagnini, and other historians of that age, of the cause of this promotion; such as that, in the midst of a famine, he had entertained two angels, or at least two pilgrims, very hospitably; who, in return, enabled him miraculously to supply the wants of the people; from all which we may gather that Piast had become popular by his liberality in a time of scarcity. All historians agree that he governed with so much justice and clemency that the Poles had no reason to regret their choice. He died at Gnesna, whither he had removed the court from Cruswitz, and was succeeded by his son, Ziemovitus.

PIAZ'ZA, *n. s.* Ital. *piazza.* A walk under a roof supported by pillars.

He stood under the *piazza.*
Arb. and Pope's Scribl.

PIAZZA, a town of the interior of Sicily, in the Val di Noto, situated on the great road from Girgenti to Catania, about twenty miles from the south-west coast. Population 13,500. It is remarkable for nothing but the number of its churches and convents; but none of the buildings are worth notice.

PIAZZA, in architecture, popularly called piache, an Italian name for a portico, or covered walk. The word literally signifies a broad open place or square; whence it also became applied to the walks or porticoes around them.

PIAZZA (Jerome Bartholomew), an Italian, originally a Roman Catholic, a Dominican friar, and a judge in the inquisition, but, turning Protestant, he came to England, and taught Italian and French at Cambridge. He published An Account of the Inquisition and its Proceedings, as practised in Italy: with an Extract out of an Authentic Book of the Roman Legends: Lond. 1722. He married a French Protestant, by whom he had three children; and died at Cambridge in 1745, with a good character.

PIBROCH, says Dr. Beattie, is a species of tune peculiar to the Highlands and Western Isles of Scotland. It is performed on a bagpipe, and differs totally from all other music. Its rhyme is so irregular, and its notes, especially in the quick movement, so mixed and huddled together, that a stranger finds it almost impossible to reconcile his ear to it, so as to perceive its modulation. Some of these pibrochs, being intended to represent a battle, begin with a grave motion resembling a march, then gradually quicken into the onset; run off with noisy confusion and turbulent rapidity, to imitate the conflict and pursuit; then swell into a few flourishes of triumphant joy; and perhaps close with the wild and slow wailings of a funeral procession.

PIC DU MIDI, LE, one of the highest mountains on the French side of the Pyrenees. Its elevation is somewhat more than 9500 feet. Thirty miles south of Pau, and seventy-five from Fontarabia, on the Bay of Biscay.

PICA, or PYE, in ecclesiastical matters, had formerly the same sense as ordinal, meaning a table or directory pointing out the order in which the devotional services appointed for different occasions were to be performed. It is derived from Πι, a contraction of πιναξ, a table; or from litera pictata, a great or black letter at the beginning of a new order in the prayers. It was used in a similar sense by officers of civil courts, who called their catalogues, or indexes of things contained in the rolls of their courts, the pyes.

PICA, among printers, is a particular size of their types or letters, so called from having been first used in printing the pye or pica above-mentioned.

PICA, in medicine, a depravation of appetite, which makes the patient long for what is unfit for food, or incapable of nourishing; as chalk, ashes, coals, plaster, lime, &c. See MEDICINE, Index.

PICA, in ornithology. See CORVUS.

PICA MARINA, in ornithology. See ALCA and HÆMATOPUS.

PICÆ, pies, in ornithology, the second order of birds in the Linnæan system. They are thus characterised by Kerr:—'The bill is sharp and convex on its upper surface. The legs are short, strongish, and of different kinds, some climbers, and some fitted for walking, i. e. having no back toe. The body is firmly constructed. The birds of this order live on various kinds of food, and are mostly unfit for food. They pair, build their nests on trees, and the male feeds the female during incubation.'—Animal Kingdom, vol. I. p. 418. There are thirty genera.

PICARD (John), an able mathematician, one of the most learned astronomers of the seventeenth century, born at Fleche. He became priest and prior of Rillie, in Anjou. Going to Paris, he was, in 1666, appointed astronomer to the Academy of Sciences. In 1671 he was sent, by order of the king, to the castle of Uraniburg, built by Tycho Brahe in Denmark, to make astronomical observations there; and thence he brought the original MSS. written by Tycho Brahe. He made important discoveries in astronomy; and was the first who travelled through France to measure a degree of the meridian. His works are, 1. A Treatise on Levelling. 2. Fragments of Dioptrics. 3. Experimenta circa Aquas Effluentes. 4. De Mensuris. 5. De Mensura Liquidorum et Aridorum. 6. A Voyage to Uraniburg, or Astronomical Observations made in Denmark. 7. Astronomical Observations made in several parts of France, &c. These, and some other of his works, which are much esteemed, are in the Memoirs of the Academy of Sciences, vols. 6 and 7.

PICARDS, a religious sect which arose in Bohemia in the fifteenth century. Picard, the author of this sect, drew after him a number of men and women, pretending he would restore them to the primitive state of innocence wherein man was created; and accordingly he assumed the title of the New Adam. Under this pretence he indulged his followers in all kinds of impurity. He first published his opinions in Germany and the Netherlands, and persuaded his people to go naked. He seized on an island in the river Laulnecz, some leagues from Thabor, the head-quarters of Zisca, where he fixed himself and his followers. At length Zisca, general of the Hussites, marched against them, made himself master of their island, and put them all to death except two; whom he spared, that he might learn their doctrine. Such is the account which various writers, relying on the authorities of Æneas Sylvius and Varillas, have given of the Picards, who appear to have been a party of the Vaudois, that fled from persecution in their own country, and sought refuge in Bohemia. But it is highly probable that the whole is a calumny invented to disgrace the Picards, because they deserted the communion of the church of Rome. Lasitius informs us that Picard, with forty other persons, besides women and children, settled in Bohemia in 1418. Balbinus the Jesuit, in his Epitome Rerum Bohemicarum, lib. ii. gives a similar account, and charges on the Picards none of the crimes ascribed to them by Sylvius. Schlecta, secretary of Ladislaus, king of Bohemia, in his letters to Erasmus, gives a particular account of the Picards, wherein he represents their principles as no other than those of the Vaudois; and M. de Beausobre has shown that they were both of the same sect, though under different denominations.

PICARDY, a former province of France, bounded on the north by Hainault, Artois, and the Straits of Calais; on the east by Champagne; on the south by the Isle of France; and on the west by Normandy and the English Channel.

The name is not more ancient than the twelfth century. It has been compared in form to a bent arm; and in this figure is nearly 150 miles long, but not above forty broad, and in many places not above twenty. It is generally level, and produces wine, fruit of all kinds, plenty of corn, and great quantities of hay; but, wood being scarce, most of the inhabitants burn turf. They have, however, some pit coal. It was united to the crown of France in the year 1643. Its principal rivers are the Somme, Oise, Canche, Scarpe, Lys, Aa, Scrape, and Deule. Since 1790 it has formed the department of the Somme, and part of those of the Aisne, and the Straits of Calais. Amiens is the capital.

PICAROON', *n. s.* Span. *picaron;* It. *picare.* A robber; a plunderer.

Corsica and Majorca in all wars have been the nests of *picaroons.* *Temple's Miscellanies.*

PICART (Bernard) an engraver, son of Stephen Picart, also a famous engraver, was born at Paris in 1673. He learned the elements of his art from his father, and studied architecture and perspective under Sebastian le Clerc. As he embraced the reformed religion, he settled in Holland, where his genius produced those master-pieces which made him esteemed the most ingenious artist of his age. A multitude of books are embellished with plates of his engraving. He died in 1733.

PICCAGE, in law (piggagium, from the Fr. piquer, i. e. effodere), a consideration, paid for the breaking up of ground to set up booths, stalls, or standings, in fairs; payable to the lord of the soil.

PICCOLOMINI (Alexander), archbishop of Patras, was born at Sienna, about 1508, of an illustrious and ancient family, originally from Rome. He composed for the theatre, and was equally distinguished for genius and virtue. His charity was very great, and was much exerted in favor of men of letters. He wrote many works in Italian. The principal are, 1. Various Dramatic Pieces. 2. A Treatise on the Sphere. 3. A Theory of the Planets. 4. A Translation of Aristotle's Art of Rhetoric and Poetry, in 4to. 5. A System of Morality; Venice 1575, in 4to.; translated into French by Peter de Larivey, in 4to.; Paris, 1581. He was the first who wrote in the Italian language upon philosophical subjects. He died at Sienna, the 12th of March, 1578, aged seventy.

Piccolomini (Francis), of the same family, was born in 1520, and taught philosophy with success for twenty-two years in the most celebrated universities of Italy, and afterwards retired to Sienna, where he died in 1604, aged eighty-four. His works are, 1. Commentaries upon Aristotle; Mentz, 1608, 4to. 2 Universa Philosophia de Moribus; Venice, 1583, folio. He labored to revive the doctrine of Plato, and imitated his manners. He had for his rival the famous James Zabarella, whom he excelled in facility of expression and elegance of language; but to whom he was much inferior in point of argument.

Piccolomini (James), whose proper name was Ammanati, took that of Piccolomini, in honor of his patron Pius II. He was born near Lucca, in 1422. He became bishop of Massa, afterwards of Frescati; a cardinal in 1461, under the title of de Pavie; and died in 1479, aged fifty-seven, of an indigestion of figs. He left 8000 pistoles in the banker's hands, which pope Sixtus IV. claimed, and of which he gave a great part to the hospital of the Holy Ghost. His works, which consist of some Letters, and a History of his own Time, were printed at Milan, in 1521, in folio. His history, entitled Commentaries, commences the 18th of June, 1464, and ends the 6th of December, 1469. They are a Sequel of Pope Pius II.'s Commentaries, which end with 1463.

Piccolomini (Octavius), of Arragon, duke of Amalfi, prince of the empire, an imperial general, and knight of the Golden Fleece, was born in 1599. He first bore arms among the Spanish troops in Italy. He afterwards served under Ferdinand II., who sent him to the relief of Bohemia, and gave him the command of the imperial troops in 1634. He signalised himself at the battle of Nortlingue, and made marshal de Chatillon raise the siege of St. Omer. He defeated the marquis Fenquieres in 1639; nor did the loss of the battle of Wolfenbuttel, in 1651, impair his glory. He died on the 10th of August, 1656, aged fifty-seven, with the character of an active general. The celebrated Caprara was his nephew.

PICENI, or Picentes, the ancient inhabitants of Picenum (Cicero, Livy), who were originally a colony of Sabines. They were different from the Picentini, on the Tuscan Sea, though called so by the Greeks; but Ptolemy calls them Piceni, as does also Pliny. Their territory at this day is supposed to form the greatest part of the march of Ancona. Cluverius.

PICENTIA, the capital of the Picentini, who inhabited the Ager Picentinus (Strabo, Pliny).

PICENTINI, an ancient people of Italy, who inhabited the Ager Picentinus. The Greeks commonly confound the Picenti and Picentes, but the Romans distinguish them. The former had only two towns, named Silernum and Picentia; the situation of both uncertain; only Pliny says the latter stood within land, at some distance from the sea. Now thought to be Bicenza (Holstentius), in the Principato Citro of Naples.

PICENTINUS Ager, an ancient district of Italy, on the Tuscan Sea, extending from the Promontorium Minervæ, the southern boundary of Campania on the coast, to the Silarus, the northern boundary of Lucania, reaching within land as far as the Samnites and Hirpini.

PICENTIUM Ager, Picenum, or Picenus Ager, a territory of Italy, lying to the east of Umbria, from the Appennine to the Adriatic; on the coast, extending from the river Aesis on the north, as far as the Prætutiani to the south. In the upper or northern part of their territory, the Umbri excluded them from the Appennine, as far as Camerinum; but in the lower or southern part they extended from the Adriatic to the Appennine. It was very fertile, and very populous. Cæs. Plin. Florus, Cic. Call. Liv. Tac. Varro.

PICHEGRU (Charles), a French revolutionary general, born in 1761, at Arbois in Franchecompté, of mean parentage. He received a good education under the monks of his native town; after which he entered into the army, and became a serjeant. In the revolution he rose to the rank of general, and in 1793 gained a victory over the allied armies at Hagenau; in consequence of which he succeeded to the command of the army of the north. His celebrated exploit was the subjugation of Holland, for which he was elected a member of the national assembly. At length he fell under the suspicion of being a royalist, and was banished to Cayenne, whence he escaped to England. Engaging in the schemes of the emigrants against Buonaparte, he went to Paris early in 1804, and was soon arrested, and committed a prisoner to the Temple. Here he was found dead (having been strangled), on the 6th of April; but whether he died by his own hand, or by that of an assassin, employed by the party in power, is a question which has been frequently and warmly agitated.

PICHINCHA, a mountain of Peru in Quito, in the province of Truxillo, estimated at 2432 toises above the level of the sea. It is, however, 1278 yards lower than the perpendicular height of Cotopaxi, and was formerly a volcano, but the crater on one of its sides is covered with sand and calcined matter; so that at present neither smoke nor fire issue from it. When Don George Juan and Antonio de Ulloa were stationed on it for the purpose of making astronomical observations, they found the cold on the top of this mountain extremely intense, the wind violent, and they were frequently involved in so thick a fog or cloud that an object at six or eight paces distance was scarcely discernible. The air grew clear, by the clouds moving nearer to the earth, and on all sides surrounding the mountain, to a vast distance, representing the sea with the mountain standing like an island in the centre. When that happened, they heard the dreadful noise of the tempests that discharged themselves on Quito and the neighbouring country. They saw the lightning issuing from the clouds, and heard the thunder roll far beneath them. While the lower parts were involved in tempests of thunder and rain, they enjoyed a delightful serenity; the wind was abated, the sky clear, and the enlivening rays of the sun moderated the severity of the cold. But, when the clouds rose, their thickness rendered respiration difficult: snow and hail fell continually, and the wind returned with all its violence; so that it was impossible entirely to overcome the fear of being, together with their hut, blown down the precipice on whose edge it was built, or of being buried in it by the constant accumulation of ice and snow. Their fears were likewise increased by the fall of enormous fragments of rocks. Though the smallest crevice visible in their hut was stopped, the wind was so piercing that it penetrated through; and though the hut was small, crowded with inhabitants, and had several lamps constantly burning, the cold was so great that each individual was obliged to have a chafing dish of coals, and several men were constantly employed every morning to remove the snow which fell in the night. By the severities of such a climate, their feet were swelled, and so tender that walking was attended with extreme pain, their hands covered with chilblains, and their lips so swelled and chopped that every motion in speaking drew blood.

'I was twice at the mouth of the crater of Pichincha,' says Humboldt, 'the mountain that overlooks the city of Quito. I know of no one but Condamine that ever reached it before; and he was without instruments, and could not stay above a quarter of an hour, on account of the extreme cold. I was more successful. From the edge of the crater rise three peaks, which are free from snow, as it is continually melted by the ascending vapor. At the summit of one of these I found a rock, that projected over the precipice, and hence I made my observations. This rock was about twelve feet long, by six broad, and strongly agitated by the frequent shocks, of which we counted eighteen in less than half an hour. We lay on our bellies, the better to examine the bottom of the crater. The mouth of the volcano forms a circular hole, nearly a league in circumference, the perpendicular edges of which are covered with snow on the top. The inside is of a deep black; but the abyss is so vast that the summits of several mountains may be distinguished in it. Their tops seemed to be 600 yards below us; judge then where their bases must be. I have no doubt that the bottom of the crater is on a level with the city of Quito. Condamine found it extinct, and even covered with snow; but we had to report the unpleasant news that it was burning. On my second visit, being better furnished with instruments, I found the diameter of the crater to be 1600 yards, whereas that of Vesuvius is but 670. The height of the mountain is 5280 yards.

PICK, *v. a.*, *v. n.* & *n. s.*
PICK'ER, *n. s.*
PICK'THANK, *n. s.*
} Saxon þæccan; Belg. and Teut. *picken*. To cull; choose; select; gather here and there; glean. It has commonly *out* after it when it implies selection, and *up* when it means casual occurrence: as a verb neuter to eat or perform any thing slowly: a picker is one who picks or culls: a pickthank, an officious fellow; a parasite.

The want of many things fed him with hope, that he should out of these his enemies distresses *pick* some fit occasion of advantage.
Knolles's History.

This fellow *picks up* wit as pigeons peas.
Shakspeare.

He hath *picked out* an act,
Under whose heavy sense your brother's life
Falls into forfeit. *Id. Measure for Measure.*

Trust me, sweet,
Out of this silence yet I *picked* a welcome;
And, in the modesty of fearful duty,
I read as much as from the rattling tongue
Of saucy and audacious eloquence. *Shakspeare.*

You owe me money, Sir John, and now you *pick* a quarrel to beguile me of it. *Id. Henry IV.*

Many tales devised,
Oft the ear of greatness needs must hear,
By smiling *pickthanks* and base newsmongers.
Shakspeare.

It hath been noted by the ancients that it is dangerous to *pick* one's ears while he yawneth; for that, in yawning, the minor parchment of the ear is extended by the drawing of the breath. *Bacon.*

It was believed that Perkin's escape was not without the king's privity, who had him all the time of his flight in a line; and that the king did this to *pick* a quarrel to put him to death. *Id.*

Contempt putteth an edge upon anger more than the hurt itself; and, when men are ingenious in *picking out* circumstances of contempt, they do kindle their anger much. *Id.*

With pleasing tales his lord's vain ears he fed,
A flatterer, a *pickthank*, and a lyar. *Fairfax.*

It were a wonder, if, after the death of a prince, there should want some *pickthank*, to insinuate himself into his successor. *Bp. Hall.*

They must *pick* me *out* with shackles tired,
To make them sport with blind activity. *Milton.*

What made thee *pick* and chuse her *out*,
To employ their sorceries about? *Hudibras.*

Hope is a pleasant premeditation of enjoyment; as when a dog expects, till his master has done *picking* a bone. *More.*

A painter would not be much commended who should *pick out* this cavern from the whole Æneids; he had better leave them in their obscurity. *Dryden.*

Imitate the bees, who *pick* from every flower that which they find most proper to make honey. *Id.*

Why standest thou *picking*? is thy palate sore,
That bete and radishes will make thee roar? *Id.*

He was too warm on *picking* work to dwell,
But faggoted his notions as they fell,
And, if they rhym'd and rattled, all was well. *Id.*

How many examples have we seen of men that have been *picked up* and relieved out of starving necessities, afterwards conspire against their patrons! *L'Estrange.*

If he would compound for half, it should go hard but he'd make a shift to *pick* it *up*. *Id.*

They are as peevish company to themselves as to their neighbours; for there's not one circumstance in nature, but they shall find matters to *pick* a quarrel at. *Id.*

The business of a *pickthank* is the basest of offices. *Id.*

He that is nourished by the acorns he *picked up* under an oak in the wood, has appropriated them to himself. *Locke.*

The *pickers pick* the hops into the hair-cloth. *Mortimer.*

If he be great and powerful, spies and *pickthanks* generally provoke him to persecute and tyrannise over the innocent and the just. *South.*

He asked his friends about him, where they had *picked up* such a blockhead. *Addison's Spectator.*

He *picks* and culls his thoughts for conversation, by suppressing some, and communicating others. *Addison.*

Deep through a miry lane she *picked* her way,
Above her angle rose the chalky clay. *Gay.*

The will may *pick* and chuse among these objects, but it cannot create any to work on. *Cheyne.*

Heaven when it strives to polish all it can,
Its last, best work, but forms a softer man,
Picks from each sex, to make the fav'rite blest,
Your love of pleasure, our desire of rest. *Pope.*

Thus much he may be able to *pick out*, and willing to transfer into his new history; but the rest of your character will probably be dropped on account of the antiquated stile they are delivered in. *Swift.*

You are not to wash your hands, till you have *picked* your sallad. *Id.*

Pick the very refuse of those harvest fields. *Thomson.*

She has educated several poor children, that were *picked up* in the streets, and put them in a way of honest employment. *Law.*

PICK, *v. a.* & *n. s.*
PICK'ED, *adj.*
PICK'AXE, *n. s.*
PICK'LOCK,
PICK'POCKET,
PICK'PURSE,
PICK'TOOTH.

Sax. þycan; Teut. *pikken;* Fr. *piquer;* Span. *picar*. To prick; pierce; peck; rob; strike with a sharp or pointed instrument: as a noun substantive, a sharp pointed tool: picked is sharp; pointed; smart: a pick-axe, an axe made to pierce or pick rather than to cut: a picklock, an instrument which penetrates and opens a lock without the key: pickpocket and pickpurse are names for the thief who steals from the pocket or purse by thrusting his hand privately into the former: picktooth, an instrument for cleansing the teeth.

The eye that mocketh at his father, the ravens of the valley shall *pick out*. *Proverbs* xxx. 17.

We take him to be a thief too, Sir; for we have found upon him, Sir, a strange *picklock*. *Shakspeare.*

I think he is not a *pickpurse* nor a horse stealer. *Id.*

I'll hide my master from the flies, as deep
As these poor *pickaxes* can dig. *Id. Cymbeline.*

The other night I fell asleep here, and had my pocket *pickt*; this house is turned bawdy-house, they *pick* pockets. *Shakspeare.*

Pick an apple with a pin full of holes not deep, and smear it with spirits, to see if the virtual heat of the strong waters will not mature it. *Bacon.*

Their tools are a *pickaxe* of iron, seventeen inches long, sharpened at the one end to peck, and flat-headed at the other to drive iron wedges. *Carew.*

In answering of a book, 'tis best to be short, otherwise he that I write against will suspect that I intend to weary him, not to satisfy him. Besides, in being long, I shall give my adversary a huge advantage; somewhere or other he will *pick* a hole. *Selden.*

As when bands
Of pioneers, with spade and *pickaxe* armed,
Forerun the royal camp, to trench a field. *Milton.*

Scipio, having such a *picklock*, would spend so many years in battering the gates of Carthage. *Browne.*

It corrupts faith and justice, and is the very *picklock* that opens the way into all cabinets. *L'Estrange.*

Let the stake be made *picked* at the top, that the jay may not settle on it. *Mortimer's Husbandry.*

With an iron *picker* clear the earth out of the hills. *Mortimer.*

Did you ever find
That any art could *pick* the lock, or power
Could force it open. *Denham.*

What the miners call chert and whern, the stone-cutters nicomia, is so hard that the *picks* will not touch it; it will not split but irregularly. *Woodward.*

Thou raisedst thy voice to describe the powerful Betty or the artful *picklock*, or Vulcan sweating at his forge, and stamping the queen's image on viler metals. *Arbuthnot.*

It is reasonable, when Esquire South is losing his money to sharpers and *pickpockets*, I should lay out the fruits of my honest industry in a law suit. *Arbuthnot's History of John Bull.*

In the face, a wart or fiery pustule, heated by scratching or *picking* with nails, will terminate corrosive. *Wiseman.*

Pickpockets and highwaymen observe strict justice among themselves. *Bentley's Sermons.*

If a court or country's made a job,
Go drench a *pickpocket*, and join the mob. *Pope.*
His fellow *pickpurse*, watching for a job,
Fancies his fingers in the cully's fob. *Swift.*

If a gentleman leaves a *picktooth* case on the table after dinner, look upon it as part of your vails. *Id.*

PICK'APACK, *adj.* } From pack, by a re-
PICK'BACK, *adj.* } duplication very common in our language. In manner of a pack: on the back.

As our modern wits behold,
Mounted a *pickaback* on the old,
Much farther off. *Hudibras.*

In a hurry she whips up her darling under her arms, and carries the other a *pickapack* upon her shoulders. *L'Estrange.*

PICKAWAY, a county in the central part of Ohio. Chief town, Circleville. Pickaway plains extend several miles south of Circleville. They are a dead level; extremely fertile, without a single tree, and are regarded as a great curiosity. Here are many fine farms, and one pleasant town called Jefferson.

PICKAWAY, chief town of Pickaway county, Ohio, is three miles from Circleville.

PICKEER', *v. a.* Ital. *piccare.* To pillage; pirate; rob; make a flying skirmish.

No sooner could a hint appear,
But up he started to *pickeer*,
And made the stoutest yield to mercy,
When he engaged in controversy. *Hudibras.*

PICK'EREL-WEED, *n. s.* From pike. A water plant, from which pikes are fabled to be generated.

The luce or pike is the tyrant of the fresh waters; they are bred, some by generation, and some not; as of a weed called *pickerel-weed*, unless Gosner be mistaken. *Walton.*

PICKERING, a market-town in the North Riding of Yorkshire, twenty-seven miles north-east from York, nine from Malton, and 226 north by west from London. It is situate on a hill, in the mountainous district of Blackmore, and had formerly a very strong castle, the ruins only of which remain; the streets are irregularly built. Here the lord of the manor holds a court the second and third Monday after Easter, and the first and second Monday after Michaelmas. The church is a large building, and in the parish are several dissenting meeting-houses. Market on Monday. Fairs, Monday before February 13th; Monday before May 12th; September 25th; and the Monday before November 22nd, all for cattle.

PICKERY, in Scots law, petty theft, or stealing things of small value.

PICKET, an out-guard posted before an army, to give notice of an enemy approaching. 2. A punishment (for some time discontinued in the British army), in which a soldier stands with one foot upon a sharp-pointed stake; the time of his standing is limited according to the offence.

PICKETS, in fortification, stakes sharp at one end, and sometimes shod with iron, used in laying out the ground, about three feet long; but, when used for pinning the fascines of a battery, they are from three to five feet long.

PICKETS, in artillery, are about five or six feet long, shod with iron, to pin the park lines in laying out the boundaries of the park.

PICKETS, in the camp, are also stakes of about six or eight inches long, to fasten the tent cords, in pitching the tents; also, of about four or five feet long, driven into the ground near the tents of the horsemen, to tie their horses to.

PIC'KLE, *n. s.* & *v. a.* } Teut. *pickle*; Belg.
PIC'KLEHERRING. } *pekel.* Any kind of salt or pungent liquor, in which flesh or other substance is preserved; thing kept in pickle: hence perplexed condition or state; a word of contempt: pickle is to preserve in pickle; to season or imbue highly with any thing; as, a pickled rogue, i. e. one consummately villanous: a pickle-herring [pickle and herring] is a jackpudding; a merry-andrew; a buffoon.

Thou shalt be whipt with wire, and stewed in brine,
Smarting in lingering *pickle.* *Shakspeare.*
How cam'st thou in this *pickle?* *Id.*

Some fish are gutted, split, and kept in *pickle*; as whiting and mackerel. *Carew's Survey of Cornwall.*

Autumnal cornels next in order served,
In lees of wine, well *pickled* and preserved. *Dryden.*

They shall have all, rather than make a war,
The straits, the Guiney-trade, the herrings too;
Nay, to keep friendship, they shall *pickle* you. *Id.*

A physician undertakes a woman with sore eyes; his way was to dawb 'em with ointments, and while she was in that *pickle* carry off a spoon. *L'Estrange.*

Another branch of pretenders to this art, without horse or *pickleherring*, lie snug in a garret. *Spectator.*

He instructs his friends that dine with him in the best *pickle* for a walnut. *Addison's Spectator.*

The *pickleherring* found the way to shake him, for, upon his whistling a country-jig, this unlucky wag danced to it with such a variety of grimaces, that the countryman could not forbear smiling, and lost the prize. *Id.*

A third sort of antiscorbuticks are called astringent; as capers, and most of the common *pickles*, prepared with vinegar. *Arbuthnot.*

Poor Umbra, left in this abandoned *pickle*,
E'en sits him down. *Swift's Miscellanies.*

PICO, an island near the coast of Africa, one of the Azores. It consists almost entirely of a mountain rising to the height of 7000 feet, and crowned with a magnificent dome; its sides are covered with vineyards, and produce considerable quantities of a fine wood in great request for furniture at Lisbon. The great wealth of Pico consists in its wine, of which it yields annually about 5000 pipes. The British commissaries of the West India colonies keep an agent at Fayal, who contracts for the principal portion of each vintage. The wine is of the color and flavor of inferior Madeira, and is held in great repute by our army and navy. The inhabitants of the Peak live chiefly in detached houses. There is a town called Lagena, chiefly for the accommodation of the monks; but no harbour, or any other anchorage that can accommodate large vessels. Pico can thus carry on trade only through the medium of Fayal, a neighbouring island.

PICQUET, a celebrated game at cards played between two persons, with only thirty-two cards; all the deuces, threes, fours, fives, and sixes, being set aside.

In playing at this game twelve cards are dealt to each, and the rest laid on the table; when, if one of the gamesters find he has not a court card in his hand, he is to declare that he has carte blanche, and tell how many cards he will lay out, and desire the other to discard, that he may show his game, and satisfy his antagonist that the carte blanche is real, for which he reckons ten. And here the eldest hand may take in three, four, or five, discarding as many of his own for them, after which the other may take in all the remainder if he pleases. After discarding, the eldest hand examines what suit he has most cards of; and, reckoning how many points he has in that suit, if the other has not so many in that, or any other suit, he reckons one for every ten in that suit, and he who thus reckons most is said to win the point. It is to be observed that, in thus reckoning the cards, every card goes for the number it bears; as a ten for ten; only all court cards go for ten, and the ace for eleven, and the usual game is 100 up. The point being over, each examines what sequences he has of the same suit, viz. how many tierces, or sequences of three cards; quartes, or sequences of four cards; quintes, or sequences of five cards, &c., he has. These several sequences are distinguished in dignity by the cards they begin from: thus ace, king, and queen, are styled tierce major; king, queen, and knave, tierce to a king; knave, ten, nine, tierce to a knave; and the best tierce, quarte, or quinte, prevails, so as to make all the others in that hand good, and to destroy all those in the other hand. In like manner a quarte in one hand sets aside a tierce in the other.

The sequences over, the antagonists proceed to examine how many aces, kings, queens, knaves, and tens each holds; reckoning for every three of any sort, three; but here too, as in sequences, he that with the same number of threes or fours has one that is higher than any the other has, makes his own good, and sets aside all his adversary's; but four of any sort, which is called a quatorze, because fourteen are reckoned for it, always set aside three.

The game in hand being thus reckoned, the eldest proceeds to play, reckoning one for every card he plays above nine, while the other follows him in the suit: but unless a card be won by one above nine, except it be the last trick, nothing is reckoned for it. The cards being played out, he that has most tricks reckons ten for winning the cards, but if they have tricks alike, neither reckons any thing. If one of them wins half the tricks, instead of ten, which is his right for winning the cards, he reckons forty, and this is called capot.

This deal being finished, each person sets up nis game; they then proceed to deal again as before; cutting afresh each time for the deal: if both parties are within a few poiuts of being up, the carte blanche is the first that reckons, then the point, then the sequences, then the quatorzes, then the tierces, and then the tenth cards. He that can reckon thirty in hand by carte blanche, points, quintes, &c., without playing, before the other has reckoned any thing, reckons ninety for them, and this is called a repike; and, if he reckons above thirty, he reckons so many above ninety. If he can make up thirty, part in hand, and part in play, before the other has told any thing, he reckons for them sixty; and this is called a repike; and if he reckons above thirty, he reckons so many above ninety. If he can make up thirty, part in hand, and part in play, before the other has told any thing, he reckons for them sixty; and this is called a pique, whence the name of the game. M. de Moivre, in his doctrine of chances, has resolved among others, the following problems:—1. To find, at picquet, the probability which the dealer has for taking one ace or more in three cards, he having none in his hands. He concludes from his computation that it is 29 to 28 that the dealer takes one ace or more. 2. To find at picquet the probability which the eldest has of taking an ace or more in five cards, he having no ace in his hand. Answer, 232 to 91, or 5 to 2, nearly. 3. To find at picquet the probability which the eldest has of taking both an ace and a king in five cards, he having none in his hand. Answer, the odds against the eldest hand taking an ace and a king are 331 to 315, or 21 to 20, nearly. 4. To find at picquet the probability of having twelve cards dealt to, without king, queen, or knave; which case is commonly called cartes blanches. Answer, the odds against cartes blanches are 1791 to 1 nearly. 5. To find how many different sets, essentially different from one another, one may have at picquet before taking in. Answer 28,967,278. This number falls short of the sum of all the distinct combinations, whereby twelve cards may be taken out of thirty-two, this number 225,792,840; but it ought to be considered that in that number several sets of the same import, but differing in suit, might be taken, which would not introduce an essential difference among the sets.

The technical terms used in picquet are as follows:—

Capot is when either of the players makes every trick for which he scores forty.

Cards signify the majority of tricks, which reckon for ten points.

Carte Blanche means a hand without a court card in the twelve dealt, which counts for ten, and takes place of every thing else.

Huitième, eight successive cards of the same suit, counts eighteen points.

Pique is when the elder hand has reckoned thirty in hand, and play before the adversary has gained one; in which case, instead of thirty, it is called sixty, adding thereto as many points as are obtained above thirty.

Point, the greatest number on the cards of the same suit in hand, after having taken in, reckoned by their pips, scores for as many points as cards.

Quart, four cards in sequence of the same suit, counts four points: there are five kinds of quarts, the first called quart-major, consists of ace, king, queen, and knave; the second, quart from a king, of king, queen, knave, and ten; the third, quart from a queen, of queen, knave, ten, nine; the fourth, quart from a knave, of knave, ten, nine, eight; the fifth, a basse-quart or quart-minor, of ten, nine, eight, and seven.

Quatorze, the four aces, kings, queens, knaves, or tens, scores fourteen points.

Quint means five cards of the same suit in sequence, and reckons fifteen points: there are four sorts of quints; a quint-major of ace king, queen, knave, and ten, down to knave, ten, nine, eight, and seven, styled a quint-minor.

Repique signifies when one of the players counts thirty or more in hand, before the adversary obtains one, then it is called ninety, reckoning as many points above ninety as were gained above thirty.

Sixiéme, or six cards of the same suit in sequence, reckons for sixteen points: there are three sorts of sixiémes, viz. sixiéme-major from the ace, sixiéme from the king, and sixiéme minor from the queen.

Septiéme, or seven of the same suit in sequence, counts for seventeen points; there are two septiémes, one from the ace, the other from the king.

Threes of aces, &c. down to tens, reckon three points.

Talon or Stock means the eight remaining cards after twelve are dealt to each player.

Tierce, or sequence of three, reckons for three: there are six kinds of tierces, tierce-major, of ace, king, queen; down to nine, eight, seven, styled tierce-minor.

For the mode of playing the general game, see Hoyle.

PICRA, a lake of Africa, which Alexander the Great crossed, when he went to consult the oracle of Jupiter Ammon.—Diod.

PICRAMNIA, in botany, a genus of the pentandria order, and diœcia class of plants; natural order doubtful: CAL. tripartite: COR. three petals; the stamina from three to five, awl-shaped, and seem to join together at the base: STYLI two, which are short and bent backwards: BERRY roundish, and contains two oblong seeds, and sometimes one seed only. There is only one species, viz.

P. antidesma, the murjoe bush. This shrub is frequent in copses and about the skirts of woods in Jamaica, rising about eight or nine feet from the ground. The leaves are oval, pointed, and placed alternately along the branches; the flower-spikes are long, pendulous, and slender; the florets small and white; the berries are numerous, at first red, then of a jet black color; the pulp is soft, and of a purple complexion. The whole plant is bitter, and especially the berry. The negroes make a decoction of them, and use it in weaknesses of the stomach, and in venereal cases.

PICRANIA, in botany, a genus of plants, of the class pentandria, and order monogynia. The species known is P. amara, or bitter wood, a tall and beautiful timber tree, common in the woods of Jamaica. The name is expressive of its sensible qualities. Every part of it is intensely bitter; and, even after the tree has been laid for floors many years, whoever rubs or scrapes the wood feels a great degree of bitterness in their mouth or throat. Cabinet-work made of this wood is very useful, as no insect will live near it. This tree has a great affinity to the quassia amara of Linnæus; in lieu of which it is used as an antiseptic in putrid fevers. When used, less of it will do than of the quassia amara of Surinam. See QUASSIA.

PICRIS, in botany, ox-tongue; a genus of the polygamia æqualis order, and syngenesia class of plants; natural order forty-ninth, compositæ. There are four species, of which the only remarkable one is the P. echioides, the common ox-tongue, growing spontaneously in corn-fields in Britain. It has undivided leaves embracing the stem, with yellow blossoms, which sometimes close soon after noon, at other times remain open till nine at night. It is an agreeable pot-herb while young. The juice is milky, but not too acrid.

PICRIUM, in botany, a genus of the monogynia order and tetrandria class of plants; natural order doubtful: CAL. monophyllous and quinquefid: COR. menopetalous, and its tube is short; the filaments are four, and hooded at their insertion; the stile long and thick, the stigma bilamellated: CAPS. round, bivalved, and contains a number of small seeds. There are two species, 1. P. ramosa, and 2. P. spicata; both natives of Guiana. Both species are bitter, and employed in dyspepsy, and to promote the menses; they are also recommended in visceral obstructions.

PICROMEL, in chemistry and anatomy, the characteristic principle of bile. If sulphuric acid, diluted with five parts of water, be mixed with fresh bile, a yellow precipitate will fall. Heat the mixture, then leave it in repose, and decant off the clear part. What remains was formerly called resin of bile, but it is a greenish compound of sulphuric acid and picromel. Edulcorate it with water, and digest with carbonate of barytes. The picromel now liberated will dissolve in the water. On evaporating this solution, it is obtained in a solid state. Or by dissolving the green sulphate in alcohol, and digesting the solution over carbonate of potassa till it cease to redden litmus paper, we obtain the picromel combined with alcohol. It resembles inspissated bile. Its color is greenish-yellow; its taste is intensely bitter at first, with a succeeding impression of sweetness. It is not affected by infusion of galls, but the salts of iron and subacetate of lead precipitate it from its aqueous solution. It affords no ammonia by its destructive distillation. Hence the absence of azote is inferred, and the peculiarity of picromel.

PICROTOXIA, in chemistry, the bitter and poisonous principle of cocculus Indicus, the fruit of the menispermum cocculus. To the filtered decoction of these berries add acetate of lead, while any precipitate falls. Filter and evaporate the liquid cautiously to the consistence of an extract. Dissolve in alcohol of 0·817, and evaporate the solution to dryness. By repeating the solutions and evaporations, we at last obtain a substance equally soluble in water and alcohol. The coloring matter may be removed by agitating it with a little water. Crystals of pure picrotoxia now fall, which may be washed with a little alcohol. The crystals are four-sided prisms, of a white color, and intensely bitter taste. They are soluble in twenty-five times their weight of water, and are not precipitable by any known re-agent. Alcohol, specific gravity 0·810, dissolves one-third of its weight of picrotoxia. Pure sulphuric ether dissolves two-fifths of its weight.

Strong sulphuric acid dissolves it, but not when much diluted. Nitric acid converts it into oxalic acid. It dissolves and neutralises in acetic acid, and falls when this is saturated with an alkali. It may therefore be regarded as a vegeto-alkali itself. Aqueous potassa dissolves it, without evolving any smell of ammonia. It acts as an intoxicating poison.

Sulphate of picrotoxia must be formed by dissolving picrotoxia in dilute sulphuric acid; for the strong acid chars and destroys it. The solution crystallises on cooling. The sulphate of picrotoxia dissolves in 120 times its weight of boiling water. The solution gradually lets fall the salt in fine silky filaments disposed in bundles, and possessed of great beauty. When dry it has a white color, and feels elastic under the teeth, like plumose alum. It is composed of

Sulphuric acid .	. 9·99	5
Picrotoxia .	. 90·01	45
	100·00	

Nitrate of picrotoxia.—Nitric acid of the specific gravity 1·38, diluted with twice its weight of water, dissolves, when assisted by heat, the fourth of its weight of picrotoxia. When this solution is evaporated to one-half it becomes viscid, and on cooling is converted into a transparent mass, similar to a solution of gum arabic. In this state the nitrate of picrotoxia is acid, and exceedingly bitter. If it be still further dried, in a temperature not exceeding 140°, it swells up, becomes opaque, and grows at last perfectly white and light, like calcined alum. If we keep it in this state, at a temperature below that of boiling water, adding a little water occasionally, the whole excess of acid exhales, and the taste becomes purely bitter. When this salt is washed in pure water, the acid is totally removed, and the picrotoxia is separated in the state of fine white plates.

Muriate of picrotoxia.—Muriatic acid, of the specific gravity 1·145, has little action on picrotoxia. It dissolves it when assisted by heat, but does not become entirely saturated. Five parts of this acid, diluted with three times its weight of water, dissolve about one part of picrotoxia at a strong boiling temperature. The liquor, on cooling, is converted into a grayish crystalline mass, composed of confused crystals. When these crystals are well washed, they are almost destitute of taste, and feel elastic under the teeth. They dissolve in about 400 times their weight of boiling water, but are almost entirely deposited on cooling. The solubility is much increased by the presence of an excess of acid.

Acetate of picrotoxia.—Acetic acid dissolves picrotoxia very well, and may be nearly saturated with it by the assistance of a boiling heat. On cooling, the acetate precipitates in well-defined prismatic needles. This acetate is soluble in fifty times its weight of boiling water. On cooling, it forms crystals of great beauty, light, without any acid smell, and much less bitter than picrotoxia itself. It is decomposed by nitric acid, which disengages the acetic acid. Dilute sulphuric acid has no marked action on it. It is not so poisonous as pure picrotoxia.—Boullay. Ann. de Chimie.

PICTAVIA, an ancient kingdom of Caledonia or Scotland, comprehending, at its most flourishing period, all the territories bounded on the north by the Forth and Clyde, and on the south by the Tweed and Solway. It was inhabited by the Picts. See PICTS.

PICTAVIUM, an ancient town of Gaul, the capital of the Pictones, called also Lemnum, now Poictiers.

PICTET (Benedict), a native of Geneva, born in 1655, of a distinguished family. After having travelled into Holland and England, he taught theology in his own country with great reputation. The university of Leyden, after the death of Spantreina, invited him to fill his place; but he preferred his own country, for which he received the thanks of the council. He died 9th of June, 1724, aged sixty-nine. He published a great number of works in Latin and French, which are much esteemed in Protestant countries. The principal of these are, 1. A System of Christian Theology in Latin, 3 vols. in 4to., best edition, 1721. 2. Christian Morality, Geneva, 1710, 8 vols. 12mo. 3. The History of the Eleventh and Twelfth centuries; a sequel to that of Sueur, 1713, 2 vols. 4to., and held in higher estimation. 4. Several Controversial Treatises. 5. A great number of tracts on morality and piety; particularly the Art of Living and Dying well; Geneva, 1705, 12mo. 6. Letters. 7. Sermons, from 1697 to 1721; 4 vols 8vo.

PICTET (John Lewis), a counsellor of Geneva, born in 1739, of the same family. He was member of the Council of Two Hundred; counsellor of state and Syndic, and died in 1781. He studied astronomy, and made several voyages into France and England. He left in MS. the Journal of a voyage which he made to Russia and Siberia in 1768 and 1769, in order to observe the transit of Venus over the sun's disk.

PICTI, or PICTÆ, Lat. painted, an ancient people of Scythia, so named, because they painted their bodies with various colors, to make them appear terrible to their enemies. They are also called Agathyrsi. According to Servius, a colony of them emigrated to the north parts of Britain, where they settled, and preserved their name and manners, and gave rise to the kingdom of the Picts. But this is disputed. See PICTS.

PICTONES, an ancient people of Gaul, mentioned by Cæsar (De Bell. Gall. vii. c. 4), who inhabited the country called Poictou in modern times, till the late revolution in France.

PICTONIUS, from the Pictones, who were subject to this disease, in medicine, applied to a species of colic. It should rather be called colica pictorum, the painter's cholic, because, from their use of lead, they are much afflicted with it.

PICTS, one of those nations who anciently possessed the north of Britain. It is generally believed that they were so called from their custom of painting their bodies; an opinion which Camden supports with great erudition. See Gough's edition, Vol I. p. xci. of the preface. It is certainly liable, however, to considerable objections; for as this custom prevailed among the other ancient inhabitants of Britain, who used the glastum of Pliny and the vitrum of Mela for that purpose, it may be asked, why the name of Picti was confined by the Romans to only one tribe, when it was equally applicable to many others? Why should they design them only by an epithet without ever annexing their proper name? Or why should they impose a new name on this people only, when they gave their proper name to every other tribe which they had occasion to speak of? As these questions cannot be answered in any satisfactory manner, we must look for some other derivation of the name. The Highlanders of Scotland, who speak the ancient language of Caledonia, express the name of this once famous nation by the term pictich, meaning pilferers or plunderers. The appellation was probably imposed upon this people by their neighbours, or assumed by themselves, some time after the reign of Caracalla, when the unguarded state of the Roman province, on which they bordered, gave them frequent opportunities of making incursions thither, and committing depredations. Accordingly this name seems to have been unknown till the end of the third century. Eumenius, the panegyrist, is the first Roman author who mentions this people under their new name of Pictich, or, with a Latin termination, picti.

Concerning the origin of the Picts, authors are much divided. Boethius derives them from the Agathyrsi, Pomponius Lætus from the Germans, Bede from the Scythians, Camden and Father Innes from the ancient Britons, Stillingfleet from a people inhabiting the Cimbrica Chersonesus, and Keating and O'Flaherty, on the authority of the Psalter Cashel, derive them from the Thracians. But the most probable opinion is, that they were the descendants of the old Caledonians. Several reasons are urged in support of this opinion by Macpherson; and the words of Eumenes, 'Caledonum, aliorumque Pictorum, silvas,' &c., plainly imply that the Picts and Caledonians were one and the same people. As there has been much dispute about the origin of the Picts, so there has been likewise about their language. There are many reasons which make it plain that their tongue was the Gaelic or Celtic; and these reasons are a further confirmation of their having been of Caledonian extract. Through the east and north-east coasts of Scotland (which were possessed by the Picts) we meet with an innumerable list of names of places, rivers, mountains, &c., which are manifestly Gaelic. From a very old registry of the priory of St. Andrew's (Dalrymple's Collections, p. 122), it appears, that in the days of Hungus, the last Pictish king of that name, St. Andrew's was called Mucross; and that the town now called Queensferry had the name of Ardchinneachan. Both these words are Gaelic. The first signifies the heath or promontory of boars; and the latter the height or peninsula of Kenneth. In the list of Pictish kings published by father Innes most of the names are obviously Gaelic, and in many instances the same with the names in the list of Scottish or Caledonian kings published by the same author. Had Innes understood any thing of this language he would not have supposed with Camden that the Picts spoke the British tongue. The two words on which they build their conjecture (strath and aber), are as common in the Gaelic as they could have been in the British, and at this day make a part of the names of places in countries to which the Pictish empire never extended. The names of Strathfillan and Lochaber may serve as instances.

The Picts of the earliest ages, as appears from the joint testimony of all writers who have examined the subject, possessed only the east and north-east coast of Scotland. On one side the ancient Drumalbin, or that ridge of mountains reaching from Lochlomond near Dumbarton to the frith of Taine, which separates the county of Sutherland from a part of Ross, was the boundary of the Pictish dominions. Accordingly we find in the life of St. Columba that, in travelling to the palace of Brudeus, king of the Picts, he travelled over Drumalbin, the Dorsum Britanniæ of Adamnan. On the other side, the territory of the Picts was bounded by the Roman province. After Britain was relinquished by the emperor Honorius, they and the Saxons by turns were masters of those countries which lie between the frith of Edinburgh and the river Tweed. We learn from Bede that the Saxons were masters of Galloway when he finished his Ecclesiastical History. The Picts, however, made a conquest of that country soon after; so that, before the extinction of their monarchy, all the territories bounded on the one side by the Forth and Clyde and on the other by the Tweed and Solway fell into their hands. The history of the Picts, as well as of all the other ancient inhabitants of Britain, is extremely dark. The Irish historians give us a long list of Pictish kings, who reigned over Pictavia for eleven or thirteen centuries before the Christian era. After them Innes, in his Critical Essay, gives us a list of above fifty, of whom no fewer than five held the sceptre, each for a whole century. It is probable that these writers had confounded the history of the Picts with that of their ancestors the old Caledonians. In any other view their accounts of them are highly fabulous; and have been long ago confuted by Dr. Macpherson, of Slate. Adamnan, abbot of Ionia, is the first author who expressly mentions any Pictish king: and the oldest after him is Bede. We are informed by these two writers that St. Columba converted Brudeus, king of the Picts, to the Christian faith. Columba came into Britain A. D. 565. The history of Drust, or Drest, who is said to have reigned over the Picts in the beginning of the fifth century, when St. Ninian first preached the gospel to that nation, A. D. 630, has all the appearance of fiction. Bede informs us that, during the reign of the ancestors of Brudens, the Picts killed Egfred, king of Northumberland, in battle, and destroyed the greatest part of his army. The same author mentions another of their kings called Naitan, to whom Ceolfrid, abbot of Wiremouth, wrote his famous letter concerning Easter and the Tonsure; a letter in which Bede himself is supposed to have had a principal hand. Roger Hoveden and Simon of Durham mention two other Pictish kings, Onnust and Kinoth, the first of whom died in 761, and the latter flourished about 774, and gave an asylum to Alfred of Northumberland, who was about that time expelled his kingdom. The accounts given by the Scottish historians of several other Pictish kings cannot be depended on; nor are the stories told by the British historians, Geoffroy of Monmouth and the author of the Eulogium Brittaniæ, worthy of greater credit. In the ninth century the Pictish nation was totally subdued by the Scots under Kenneth II. Since that time their name has been lost in that of the conquerors, with whom they were incorporated: however, they seem to have been treated by the Scottish kings with great lenity, so that for some ages after they commanded respect. The prior of Hogulstead, an old English historian, relates that they made a considerable figure in the army of David I., in his disputes with Stephen, king of England. In a battle fought in 1136, by the English on one side and the Scots and Picts on the other, the latter insisted on their hereditary right of leading the van of the Scots army, and were indulged in that request. The principal seat of the Pictish kings was at Abernethy. Brudeus, however, as appears from the accounts given by Adamnan, in his life of Columba, had a palace at Inverness. With respect to the manners and customs of the Picts, there is no reason to suppose they were any other than those of the old Caledonians and Scots, of which many particulars are related in the Roman writers. Upon the decline of the empire, cohorts of barbarians were raised, and Picts were invited into the service, by Honorius, when peace was every where restored, and were named Honoriaci. Those under Constantine opened the passes of the Pyrenean mountains, and let the barbarous nations into Spain. From this period we date the civilisation of their manners, which happened after they had by themselves, and then with the Scots, ravaged this Roman province.

PICTS' WALL, in antiquity, a wall begun by the emperor Adrian, on the northern bounds of England, to prevent the incursions of the Picts and Scots. It was first made only of turf, strengthened with palisadoes, till the emperor Severus, coming into Britain in person, built it with solid stone. This wall, part of which still remains, began at the entrance of the Solway Frith in Cumberland, and running north-east extended to the German Ocean. See ADRIAN and SEVERUS.

PICTURE, *n. s.* & *v. a.* } Lat. *pictura.* A resemblance of persons or things, particularly in colors; the science of painting: to paint or represent: pictorial (only used by Browne) is, produced by a painter; or referring to painting.
PICTO'RIAL, *adj.* }

All filled with these rueful spectacles of so many wretched carcases starving, that even I, that do but hear it from you, and d *picture* it in my mind, do greatly pity it. *Spenser.*

Madam, if that your heart be so obdurate,
Vouchsafe me yet your *picture* for my love,
The *picture* that is hanging in your chamber.
Shakspeare.

I have not seen him so *pictured.* *Id.*

Pictures and shapes are but secondary objects, and please or displease but in memory. *Bacon.*

Quintilian, when he saw any well-expressed image of grief either in *picture* or sculpture, would usually weep. *Wotton.*

He who caused the spring to be *pictured,* added this rhyme for an exposition.
Carew's Survey of Cornwall.

Sea horses are but grotesco delineations, which fill up empty spaces in maps, as many *pictorial* inventions, not any physical shapes. *Browne.*

It is not allowable, what is observable of Raphael Urban; wherein Mary Magdalen is *pictured* before our Saviour washing his feet on her knees, which will not consist with the strict letter of the text.
Browne's Vulgar Errours.

Your neighbours would not look on you as men,
But think the nations all turned *picts* again. *Lee.*

If nothing will satisfy him, but having it under my hand, that I had no design to ruin the company of *picture*-drawers, I do hereby give it him.
Stillingfleet.

His thoughts, which are the *pictures* and results of passions, are generally such as naturally arise from those disorderly motions of our spirits. *Dryden.*

Devouring what he saw so well designed,
He with an empty *picture* fed his mind. *Id.*

It suffices to the unity of any idea, that it be considered as one representation or *picture,* though made up of ever so many particulars. *Locke.*

Love is like the painter, who, being to draw the *picture* of a friend having a blemish in one eye, would *picture* only the other side of his face. *South.*

Fond man,
See here thy *pictured* life.
Thomson's Winter.

She often shows them her own *picture,* which was taken when their father fell in love with her. *Law.*

Borne on fine wires amid the *pictured* skies
With ivory orbs the planets set and rise;
Round the dwarf earth the pearly moon is rolled,
And the sun twinkling whirls his rays of gold.
Darwin.

PICTURESQUE BEAUTY refers to 'such beautiful objects as are suited to the pencil.' This epithet is chiefly applied to nature, though it will often apply to the works of art also. Those objects are most properly denominated picturesque which are disposed by the hand of nature with a mixture of varied rudeness, simplicity, and grandeur. A plain neat garden, with little variation in its plan, and no striking grandeur in its position, displays too much of art, design, and uniformity, to be called picturesque. 'The ideas of neat and smooth,' says Mr. Gilpin, 'instead of being picturesque, in fact, disqualify the object in which they reside from any pretensions to picturesque beauty. Nay, farther, we do not scruple to assert that roughness forms the most essential point of difference between the beautiful and the picturesque; as it seems to be that particular quality which makes objects chiefly pleasing in painting. I use the general term roughness; but, properly speaking, roughness relates only to the surfaces of bodies: when we speak of their delineation we use the word ruggedness. Both ideas, however, enter equally into the picturesque, and both are observable in the smaller as well as in the larger parts of nature; in the outline and bark of a tree, as in the rude summit and craggy sides of a mountain.

'Let us then examine our theory by an appeal to experience, and try how far these qualities enter into the idea of picturesque beauty, and how far they mark that difference among objects which is the ground of our enquiry. A piece of Palladian architecture may be elegant in the last degree; the proportion of its parts, the propriety of its ornaments, and the symmetry of the whole, may be highly pleasing: but, if we introduce it into a picture, it immediately becomes a formal object, and ceases to please. Should we wish to give it picturesque beauty, we must use the mallet instead of the chisel: we must beat down one half of it, deface the other, and throw the mutilated members around in heaps; in short, from a smooth building we must turn it into a rough ruin. No painter who had the choice of the two objects would hesitate a moment. Again, why does an elegant piece of garden ground make no figure on canvas?—The shape is pleasing, the combination of the objects harmonious, and the winding of the walk is the very line of beauty. All this is true; but the smoothness of the whole, though right, and as it should be in nature, offends in picture. Turn the lawn into a piece of broken ground, plant rugged oaks instead of flowering shrubs, break the edges of the walk, give it the rudeness of a road, mark it with wheel tracks, and scatter around a few stones and brush-wood; in a word, instead of making the whole smooth, make it rough, and you make it also picturesque. All the other ingredients of beauty it already possessed.'

Picturesque composition, in art, may be defined, to speak generally, as the art of uniting, in one whole, a variety of irregularly grand and striking parts, which parts may be sought and found among the works of art, though in a far less proportion, as well as in the works of nature. Objects may likewise be made picturesque: this, however, is hazardous work, and there is no small danger of missing the picturesque and falling into the ridiculous. Artificial ruins, for example, can seldom be regarded as matters of good taste: and, when the trick is known, the eye, or rather the imagination through the medium of the eye, refuses to recognise therein any of the principles of romantic beauty sought to be imparted. The great source of picturesque beauty is Nature in all her original variety and irregular grandeur. 'We seek it,' says the authority quoted above, 'among all the ingredients of landscape—trees, rocks, broken grounds, woods, rivers, lakes, plains, valleys, mountains, and distances. These objects, in themselves, produce infinite variety; no two rocks or trees are exactly the same; they are varied a second time by combination; and almost as much a third time by different lights and shades, and other aerial effects. Sometimes we find among them the exhibition of a whole, but oftener we find only beautiful parts.'

PICUIPINIMA, in ornithology, is the name of a species of pigeon in Brasil. It is so very small as scarcely to exceed the lark in size. Its head, neck, and wings, are of a pale lead color, with a black semilunar mark at the extremity of each wing; but its long wing-feathers, which are seen when the wings are expanded in flying, are of a reddish brown on one side, and blackish on the other, with black ends or tips; the tail is long, and is variegated with black, white, and brown; the belly is covered with white feathers, every one of which has a brown mark of the shape of a half-moon at the end.

PICUMNUS AND PILUMNUS were two deities at Rome, who presided over the auspices required before the celebration of nuptials. Pilumnus was supposed to patronise children, as his name seems in some manner to indicate, quod pellit mala infantiæ. The manuring of land was first invented by Picumnus, for which reason he is called Sterquilinius. Pilumnus is also invoked as the god of bakers and millers, as he is said to have first invented the art of grinding corn.

PICUS, in fabulous history, a king of Latium, son of Saturn. He married Venilia, or Canens, by whom he had Faunus; was beloved by the goddess Pomona, and returned her affection. As he was one day hunting in the woods he was met by Circe, who became deeply enamoured of him, and who changed him into a woodpecker, called by the name of picus among the Latins. His wife Venilia was so disconsolate, when she was informed of his death, that she pined away. Some say that Picus was the son of Pilumnus, and that he gave out prophecies to his subjects by means of a favorite woodpecker; from which originated the fable of his being metamorphosed into that bird.

PICUS (John), earl of Mirandola, a prodigy of parts and learning, was the youngest child of John Francis Picus, earl of Mirandola and Concordia; and was born in 1463. The progress that he made in letters was extremely rapid. He was the scholar of R. Jochanan, a German Jew, who confirmed his natural fondness for the cabalistical writings. After visiting the most famous universities of France and Italy, he went to Rome; where, in 1486, before he was twenty-four years of age, he published 900 propositions in logic, mathematics, physics, divinity, cabalistic learning, and magic, drawn not only from Greek and Latin, but even from Jewish and Arabian writers; subjoining to his advertisement, that, 'if any philosopher or divine would come to Rome to dispute with him upon any or all of them, he would defray the expenses of his journey from the remotest corners of Italy.' But, some of his propositions being charged with heresy, he was forbid to dispute upon them. At the age of twenty-eight he confined himself wholly to the study of the Scriptures; and undertook to combat the Jews and Mahometans, as well as to confound judicial astrology. He died in 1494, in his thirty-second year. He was called the phœnix of his age, and by Scaliger Monstrum sine Vitio. He composed a great number of works, which have often been printed.

PICUS (John Francis), prince of Mirandola, nephew of John Picus mentioned above, was born about the year 1469. He cultivated learning and the sciences after the example of his uncle; but had a principality and dominions to superintend, which involved him in great troubles, and at last cost him his life. He was twice driven from his principality, and twice restored; and at last, in 1533, was, together with his eldest son Albert, assassinated in his own castle by his nephew Galeoti. He was a great lover of letters; and such of his works as were then composed were inserted in the Strasburgh edition of his uncle's in 1504, and continued in future impressions, besides some others which were never collected.

Picus, the woodpecker, in ornithology, a genus belonging to the order of picæ. The beak is straight, and consists of many sides, and is like a wedge at the point: the nostrils are covered with bristly feathers; the tongue is round like a worm, very long, and sharp at the point, which is beset with bristles bent backwards. The grand characteristic, says Latham, of these birds is the tongue (which in no bird is similar, the wryneck excepted, whose other characters, however, differ too widely to give it place in this class), the muscles necessary to the motions of which are singular and worthy of notice; affording the animal means of darting it forwards the whole length, or drawing it within the mouth at will. Mr. Latham enumerates no fewer than fifty species of woodpeckers, and nine varieties. The most remarkable are: 1. P. auratus, the gold-winged woodpecker, is about eleven inches long, and weighs about five ounces. The bill is an inch and a half long, and is somewhat bent, and is not square but roundish, ridged only on the top, the point being sharp; the upper parts of the head and neck are ash-colored; the hind head is red; the sides of the head, throat, and fore part of the neck, are pale yellow; on each side of the head is a stripe of black, from the base of the lower jaw to the neck; the back, scapulars, and wing-covers, are of a gray brown color, transversely striated with black lines; the rump is whitish; the breast, belly, and sides, are whitish-yellow, and each feather is marked with a round black spot at the tip; on the middle of the breast there is a large crescent of black; the thighs, upper and under tail-coverts, are black and white mixed; the quills are brown, with yellow shafts spotted with brown on the outer edge; the tail is blackish, being outwardly edged with gray; the other feather is dotted with whitish on the margins; the shafts of all but the two middle feathers are yellow half way from the base; and the legs and claws are brown. The female differs in having the crown and neck behind gray-brown; the hind head of a less vivid red; and the greater quills not spotted on the edges. She also wants the black list on the throat, but otherwise is like the male. This species inhabits Virginia, Carolina, and Canada, and abounds in New Jersey and about New York, where it is called by some hittock or pint, and by others high-hole. Both the former names have some relation to its note; and the latter, perhaps, to the situation of the nest. It is almost continually on the ground, and is not observed to climb on the trees like others of the genus. It lives chiefly on insects, and is commonly very fat, so as to be thought very palatable for the table. It stays all the year. In its form, and some of its qualities, it resembles the cuckoo. It flies to the top of trees, and sits occasionally on the branches. Forster, in the Philosophical Transactions, says it is a bird of passage in the northern parts of America, visiting the neighbourhood of Albany Fort in April, and leaving it in September: that it lays from four to six eggs, in hollow trees, and feeds on worms and other insects.

2. P. erythrocephalus, the red-headed woodpecker, is about eight inches and three-quarters long, and weighs two ounces. The bill is an inch and a quarter in length, of a lead color, with a black tip; the irides are dusky; the head and the neck are of a most beautiful crimson; the back and wings are black; the rump, breast, and belly, are white; the first ten quills are black, the eleventh black and white, and the others are white with black shafts; the tail is black and cuneiform; the legs and claws are of a lead color. The cock and hen are very nearly alike. This species inhabits Virginia, Carolina, Canada, and most of the parts of North America; but, at the approach of winter, it migrates more or less to the south, according to the severity of the season; and upon this circumstance the people of North America foretel the rigor or clemency of the ensuing winter. Kalm observes that it is a very common bird, and is very destructive to the maize fields and orchards, pecking through the ears of maize, and destroying great quantities of apples. In some years they are more numerous than in others, when they attack the orchards where the sweet apples grow, which they eat so far that nothing remains but the mere peels. Some years ago there was a premium of two-pence per head paid from the public fund to extirpate these pernicious birds. They are likewise very fond of acorns. In Virginia and Carolina they stay the whole year, but are not seen in such numbers in winter as in summer. During the winter they are very tame, and often come into the houses, as the redbreast does in England. This species is found chiefly in old trees; and the noise they make with their bills may be heard above a mile distant. It builds the earliest of all the woodpeckers, and generally pretty high from the ground. It is accounted very good eating.

3. P. flavus, the yellow woodpecker, is about nine inches long. The bill is of a yellowish white, and more than an inch long; the hind head is crested; the head itself, the neck, and whole body, are covered with dirty-white feathers; from the lower jaw to the ears, on each side, there is a red stripe; the wing-coverts are brown and edged with yellowish, and some of the greater ones are mixed with rufous on the inner web; the quills are brown or rufous; the tail is black; the legs and claws are gray. This species is common at Cayenne, and is called there chapentier jaune. It makes its nest in old trees which are rotten within; making with its bill a hole from without, at first horizontal, but declining downward as soon as it has pierced through the sound part, till it is at last a foot and a half below the first opening. The female lays three white, and nearly round, eggs, and the young are hatched about the beginning of April. The male bears his share in the work with the female; and, in her absence, keeps sentinel at the entrance of the hole. The note of this bird is a kind of whistle six times repeated, of which the two or three last are in a graver accent than

the others. The female wants the red band on the side of the head which the male has. Specimens vary; some are of that dirty-white, as Brysson describes it, others of a light-yellow; which last was the case in a specimen in the Leverian museum: this is thirteen inches in length.

4. P. major, the great spotted woodpecker, weighs two ounces and three-quarters; the length is nine inches, the breadth sixteen. The bill is one and a quarter long, of a black horn color. The irides are red. The forehead is of a pale buff-color; the crown of the head a glossy black; the hind part marked with a rich deep crimson spot. The cheeks are white, bounded beneath by a black line, that passes from the corner of the mouth, and surrounds the hind part of the head. The neck is encircled with a black color; the throat and breast are of a yellowish-white; the vent-feathers of a fine light crimson. The back, rump, and coverts of the tail, and lesser coverts of the wings, are black; the scapular feathers, and coverts adjoining to them, are white. The quill feathers are black, elegantly marked on each web with round white spots. The four middle feathers of the tail are black, the next tipped with dirty-yellow; the bottoms of the two outmost black; the upper parts a dirty-white. The exterior feathers marked on each web with two black spots; the next with two on the inner web, and only one on the other. The legs are of a lead color. The female wants that beautiful crimson spot on the head; in other respects the colors of both agree. This species is much more uncommon than the viridis, No. 10, and keeps altogether in the woods. They are pretty common in England, France, Germany, and other parts of Europe, frequenting the woods, and are likewise met with in America. They are very cunning, and hide themselves when observed. The extreme facility with which these birds descend and ascend the trees is surprising.

5. P. martius, the greatest black woodpecker, is about the size of a jackdaw, being about seventeen inches long; the bill is nearly two inches and a half in length, of a dark ash color, and whitish on the sides; the irides are pale yellow, and the eyelids are naked according to Scopoli; the whole bird is black, except the crown of the head, which is vermilion; the first quill-feather is the shortest, and the two middle tail-feathers, which are longer than the others, make it appear a little rounded; the legs are of a lead color, covered with feathers on the fore part for half their length. The female differs from the male in having the hind head only red, and not the whole crown of the head; and the general color of the plumage has a strong cast of brown in it. Sometimes the red on the hind head is wholly wanting; and indeed both male and female vary in different subjects, in their proportion of red on the head. This species is found on the continent of Europe, but is numerous only in Germany. It is not an inhabitant of Italy or France, but it is found in Sweden, Switzerland, and Denmark, though not in winter. It builds in old ash and poplar trees, making large and deep nests; and Frisch observes that they often so excavate a tree that it is soon after blown down with the wind; and that under the hole of this bird may often be found a bushel of dust and bits of wood. The female lays two or or three white eggs, the color of which is peculiar to the whole of the genus.

6. P. medius, the middle-sized woodpecker, agrees with the major (No. 4) in colors and size, excepting that the crown of the head of this is of a rich crimson; the crown of the head in the male of the former black; and the crimson is in form of a bar on the hind part. Birds thus marked have been shot in Lancashire, and other parts of England; but Mr. Pennant is doubtful whether they are varieties, or distinct species.

7. P. minor, the least spotted woodpecker, scarcely weighs an ounce: the length is six inches; the breadth eleven. The forehead is a dirty white: the crown of the head in the male of a beautiful crimson: the cheeks and sides of the neck are white, bounded by a bed of black beneath the former. The hind part of the head and neck, and the coverts of the wings, are black; others varied with black and white; the breast and belly are of a dirty white: the crown of the head, in the female, is white; the feet are of a lead color. It has all the characters and actions of the greater kind, but is not so often met with. Buffon affirms that it inhabits most parts of France. It approaches near habitations in winter, and may be seen in orchards adjoining to houses. It builds in a hole of a tree, and often disputes the right of possession with the little colemouse. Willoughby says it is called in England by the name of hickwall. It is said to inhabit the higher parts of Asia.

8. P. principalis, the white-billed woodpecker, is somewhat bigger than the martius (No. 5) and equal in size to a crow. It is sixteen inches long, and weighs about twenty ounces. The bill is white as ivory, three inches long, and channelled; the irides are yellow, and on the hind head is an erect pointed crest, of a fine red color, some of the feathers of which are two inches long; the head itself, and the body in general, are black; but the lower part of the back, rump, and upper tail-coverts, are white; from the eye there arises a stripe of white, which passes on each side of the neck down to the back; three or four of the prime quills are black, but the rest are white; the tail is cuneiform, and of the same color as the body; the legs and claws are also black. This species inhabits Carolina, Virginia, New Spain, and Brasil, and is called by the Spaniards carpenter, and not without reason, as this, as well as the other species, make a great noise with the bill against the tree, in the woods, where they may be heard at a great distance, as if carpenters were at work, making, according to Catesby, in an hour or two a bushel of chips. He adds that the Canadian Indians make use of the bills of these birds for coronets, setting them round in a wreath with the points outwards; and that the northern Indians purchase them of the southern at the rate of two or three buck skins' per bill. Kalm says they are found in New Jersey, though very seldom, and only at certain seasons.

9. P. pubescens, the little wookpecker, according to Catesby, weighs only about an ounce and a half. Brisson says it is larger than the

smallest of our European species, being about five inches and a half long. The bill is about eight lines long, and of a horn color; the top of the head is black, and on each side above the eye is a white line; the hind head is red: the hind parts of the neck, the back, and rump are black, which is divided into two parts by a line of white passing down the middle to the rump; the scapulars, upper wing, and tail-coverts are black; the greater wing-coverts and quills are spotted with white; the under parts of the body are pale gray; the tail is black; the four middle feathers are plain, the rest are barred with white and black; and the legs and claws are black. The female has no red on the hind head. Linnæus says that the outer tail-feather is white, marked with four black spots. This species inhabits Virginia and Carolina. According to Kalm, it abounds in New Jersey, where it is the most daring and dangerous to orchards. As soon as it has pecked one hole in a tree, it makes another close to the first, in a horizontal direction, proceeding till it has made a circle of holes quite round the tree; and the apple-trees in the orchards have often several rings of holes round the stem, insomuch that the tree frequently dries up and decays.

10. P. viridis, the green woodpecker, weighs six ounces and a half; its length is thirteen inches, the breadth twenty and a half; the bill is dusky, triangular, and nearly two inches long; the crown of the head is crimson, spotted with black, and the males have a rich crimson mark beneath the blackness; the back, neck, and lesser coverts of the wings, are green; the rump of a pale yellow; the whole of the under part of the body is of a very pale green, and the thighs and vent are marked with dusky lines; the legs and feet are of a cinereous green; the tail consists of ten stiff feathers, whose ends are generally broken, as the bird rests on them in climbing; their tips are black; the rest of each is alternately barred with dusky and deep green. These birds feed entirely on insects; and their principal action is that of climbing up and down the bodies or boughs of trees; for the first purpose they are provided with a long slender tongue, armed with a sharp bone, and barbed on each side, which by the means of a curious apparatus of muscles they can exert at pleasure, darting it to a great length into the clifts of the bark, transfixing and drawing out the insects that lurk there. They make their nests in the hollows of trees: in order, therefore, to force their way into these cavities, their bills are formed strong, very hard, and wedge-like at the end; Dr. Derham observes, that a neat ridge runs along the top, as if an artist had designed it for strength and beauty. Yet it has not power to penetrate a sound tree; their perforation of any tree is a warning to the owner to throw it down. Their legs are short, but strong; their thighs very muscular; their toes disposed two backward, two forward; the feathers of the tail very stiff, sharp pointed, and bending downwards. The first three circumstances admirably concur to enable them to run up and down the sides of trees with great security; and the strength of the tail supports them firmly when they continue long in one place, either where they find plenty of food, or while they are forming an access to the interior part of the timber. This form of the tail makes their flight very aukward, as it inclines their body down, and forces them to fly with short and frequent jerks when they would ascend, or even keep in a line. This species feeds oftener on the ground than any other of the genus: all of them make their nests in the hollows of trees; and lay five or six eggs, of a beautiful semi-transparent white. These birds sometimes build in a hollow ash or other tree, fifteen or twenty feet from the ground. The male and female take it by turns to bore through the living part of the wood, till they come to the rotten part, wherein, after being hollowed out to a proper depth, they lay their eggs, which are generally greenish, with small black spots. These holes are so deep, that a man may thrust his whole arm down one of them till he reach the eggs. The young ones climb up and down the tree before they can fly. The holes of the woodpecker are as perfectly round as if made by a pair of compasses. Nuthatches, starlings, and bats, frequently build in these holes when deserted. Both Frisch and Klein mistake in saying that the females have not the red crown; for even the young ones in the nest have the appearance of it; but they do not become of a full red till after the first moult. They are fond of bees, and make great havock among them. Salerne says they are found in the markets of Italy. In Sir A. Lever's museum there was a variety of this bird of a straw color, except the crown, which is faintly marked with red.

PID'DLE, *v. n.* & *n. s.* This word is obscure in its etymology, says Johnson. Skinner derives it from Ital. *picciolo*, or Fr. *petit*, little. Mr. Lye thinks it the diminutive of the Welsh *breyta*, to eat; perhaps it comes from peddle, to deal in little things. It is used also as a diminutive of puddle.

From stomach sharp, and hearty feeding,
To *piddle* like a lady breeding.
Swift's Miscellanies.

I speak only of the general outline of their constitution; *piddling* objections may be made to particular parts, and experience will point out the necessity of reconsidering many things. *Bp. Watson.*

PIE, *n. s.* Derived by Skinner from biezan to build, that is, to build of paste; by Junius, by contraction from pasty; a crust baked with something in it.

No man's *pie* is freed
From his ambitious finger.
Shakspeare. Henry VIII.

Mincing the meat in *pies* saveth the grinding of the teeth, and more nourishing to them that have weak teeth. *Bacon.*

He is the very Withers of the city; they have bought more editions of his works than would serve to lay under all their *pies* at a lord mayor's Christmas. *Dryden.*

Chuse your materials right;
From thence of course the figure will arise,
And elegance adorn the surface of your *pies*.
King.

Eat beef or *pie*-crust, if you'd serious be. *Id.*

PIE, *n. s.* }
PIE'BALD, *adj.* }
PIED }
PIED'NESS, *n. s.* } Fr. *pie*; Lat. *pica*. A magpie; a party-colored bird: hence of various colors: piebald and pied signify variegated.

The *pie* will discharge thee for pulling the rest. *Tusser.*

There is an art, which in their *piedness* shares
With great creating nature.
Shakspeare. Winter's Tale.

The raven croaked hoarse on the chimney's top,
And chattering *pies* in dismal discords sung.
Shakspeare.

All the yearlings which were streaked and *pied*,
Should fall as Jacob's hire. *Id. Merchant of Venice.*

Pied cattle are spotted in their tongues. *Bacon.*

The seat, the soft wool of the bee,
The cover, gallantly to see,
The wing of a *pied* butterfly,
I trow 'twas simple trimming. *Drayton.*

They desire to take such as have their feathers of *pied*, orient and various colours. *Abbot.*

Meadows trim with daisies *pied*,
Shallow brooks and rivers wide. *Milton.*

It was a particoloured dress
Of patched and *piebald* languages.
Hudibras.

Who taught the parrot human notes to try,
Or with a voice endu'd the chattering *pie*?
'Twas witty want. *Dryden.*

They would think themselves miserable in a patched coat, and yet contentedly suffer their minds to appear abroad in a *piebald* livery of coarse patches and borrowed shreds. *Locke.*

They are pleased to hear of a *piebald* horse that is strayed out of a field near Islington, as of a whole troop that has been engaged in any foreign adventure. *Spectator.*

Peel'd, patch'd, and *piebald*, linsey-woolsey brothers,
Grave mummers! sleeveless some, and shirtless others. *Pope.*

PIE, *n. s.* Sax. pie; Fr. *pie*. An old popish service-book, so called, as is supposed, from the different colors of the text and rubric. 'Cock and pie,' says Dr. Johnson, 'was a slight expression in Shakspeare's time, of which I know not the meaning.' It means the above, a book of devotion; a rubric. Lat. *coccus* and *pius*.

Mr. Slender, come; we stay for you.
—I'll eat nothing, I thank you, Sir;
—By cock and *pie* you shall not chuse, Sir; come, come. *Shakspeare. Merry Wives of Windsor.*

PIE POWDER COURT, in English law, curia pedis pulverizati, the court of Dusty-foot, from the French pied, pes, and poudreux, pulverulentus, a court held in fairs, to administer justice to buyers and sellers, and for redress of disorders committed in them. Skene, de Verbor. signif., verbo Pes-pulverosus says, the word signifies a vagabond; especially a pedlar, who has no dwelling, therefore must have justice summarily administered to him, viz. within three ebbings and three flowings of the sea. Bracton, lib. 5, tract. 1, c. 6, num. 6, calls it Justitiam pepoudrous. Of this court, read the statute 17 Edw. IV. c. 2: 4 Inst. 272: and Cromp. Jur. 221. Among our Saxon ancestors it was called ceapung-gemot, i. e. a court of merchandise, or handling matters of buying and selling. It is mentioned in Doctor and Student, c. 5, which says, it is a court incident to fairs and markets, to be held only during the time that the fairs are kept.—Cowell. The fair of St. Giles, held on the hill of that name, near the city of Winchester, by virtue of letters patent of king Edw. IV., has a court of Pie-powder of a transcendant jurisdiction; the judges whereof are called justices of the Pavilion, and have their power from the bishop of Winchester.

PIECE, *n. s., v. a., & v. n.* }
PIECE'LESS, *adj.* }
PIECE'MEAL, *adj.* & *adv.* } French *piece*; Ital. *pizza, pecia*; Span. *pieza*; barb. Lat. *petia*. A part; fragment; portion; complete part or specimen; picture; composition; performance; great or small gun; coin: to piece is to add to or repair by pieces: hence to join; unite; coalesce: pieceless, an obsolete adjective for whole; not made up of separate or different pieces: piece-meal (Sax. pice-mel), in pieces; single; separate: a-piece is an idiomatical expression for 'to each' (piece or person), 'of a-piece,' signifies like, i. e. as of the same piece.

Bring it out *piece* by *piece*. *Ezek.* xxiv. 26.

The chief captain, fearing lest Paul should have been pulled in *pieces* of them, commanded to take him by force. *Acts.*

When he cometh to experience of service abroad, or is put to a *piece* or a pike, he maketh as worthy a soldier as any nation he meeteth with. *Spenser.*

Pyrrhus, with continual battery of great *pieces*, did batter the mount.
Knolles's History of the Turks.

A *piece* of ordnance 'gainst it I have placed.
Shakspeare.

I speak too long, but 'tis to *piece* the time,
To draw it out in length. *Id. Merchant of Venice.*

He *pieces out* his wife's inclination; he gives her folly, motion, and advantage. *Shakspeare.*

Many of the ships have brass *pieces*, whereas every *piece* at least requires four gunners to attend it.
Raleigh's Essays.

Plant it with women as well as men, that it may spread into generations, and not be *pieced* from without. *Bacon.*

The cunning priest chose Plantagenet to be the subject his pupil should personate; because he was more in the present speech of the people, and it *pieced* better and followed more close upon the bruit of Plantagenet's escape. *Id.*

In those poor types of God, round circles; so
Religion's types the *pieceless* centres flow,
And are in all the lines which always go.
Donne.

He strook his helme, full where his plume did stand,
On which it *piece-meal* brake, and fell from his unhappy hand. *Chapman.*

I'll be torn *piecemeal* by a horse,
Ere I'll take you for better or worse.
Hudibras.

Truth and fiction are so aptly mixed,
That all seems uniform and *of a piece*.
Roscommon.

I demand, concerning all those creatures that have eyes and ears, whether they might not have had only one eye, and one ear a-*piece*. *More.*

It is accounted a *piece* of excellent knowledge, to know the laws of the land. *Tillotson.*

Whether the *piecing out* of an old man's life is worth the pains, I cannot tell. *Temple.*

If unnatural, the finest colours are but dawbing, and the *piece* is a beautiful monster at the best.
Dryden.

My own is *of a piece* with his, and, were he living, they are such he would have written. *Id.*

Too justly ravished from an age like this;
Now she is gone, the world is *of a piece*. *Id.*

When Jupiter granted petitions, a cockle made request, that his house and his body might be all *of a piece*. *L'Estrange.*

These lesser rocks or great bulky stones, that lie scattered in the sea or upon the land, are they not manifest fragments and *pieces* of these greater masses? *Burnet.*

Neither was the body then subject to distempers, to die by *piecemeal*, and languish under coughs or consumptions. *South.*

He wrote several *pieces* which he did not assume the honour of. *Addison.*

A man that is in Rome can scarce see an object, that does not call to mind a *piece* of a Latin poet or historian. *Id.*

Other blasphemies level, some at one attribute, some at another; but this, by a more compendious impiety, shoots at his very being, and, as if it scorned these *piecemeal* guiles, sets up a single monster big enough to devour them all. *Government of the Tongue.*

When once the poet's honour ceases,
From reason far his transports rove;
And Boileau, for eight hundred *pieces*,
Makes Louis take the wall of Jove. *Prior.*

Why did I not his carcase *piecemeal* tear,
And cast it in the sea? *Derham.*

The ball goes on in the direction of the stick, or of the body of the *piece* out of which it is shot. *Cheyne.*

Each heavenly *piece* unweary'd we compare,
Match Raphael's grace with thy loved Guido's air. *Pope.*

Piecemeal they win this acre first, then that;
Glean on and gather up the whole estate. *Id.*

His other *pieces* were read only by those few who delight in obsolete books. *Johnson.*

Piece, in matters of money, signifies sometimes the same thing with species; and sometimes, by adding the value of the pieces, it is used to express such as have no other particular name.

Piece is also a kind of money of account, or rather a manner of accounting, used among the negroes on the coast of Angola in Africa. See Money.

Piece, in heraldry, denotes an ordinary or charge. The honorable pieces of the shield are the chief, fess, bend, pale, bar, cross, saltier, chevron, and in general all those which take up one-third of the field, when alone, and in what manner soever it be. See Heraldry.

Pieces, in the military art, include all sorts of great guns and mortar. Battering pieces are the larger sort of guns used at sieges for making the breaches; such are the twenty-four pounder and culverine, the one carrying a twenty-four and the other an eighteen pound ball. Field pieces are twelve pounders, six pounders, &c., which march with the army. A soldier's firelock is likewise called his piece.

PIEDMONT, a province of Sardinia, forming the north-west portion of Italy, having France on the west, and Lombardy on the east. It is the principal continental province of the kingdom, and contains a superficial extent of nearly 13,000 square miles, which presents a succession of mountains and hills, commencing to the west with the loftiest of the Alps, and gradually diminishing in height as they approach the beautiful plains which form the central part of the province, and extend to Lombardy. Piedmont is of an oblong form, and largest from north to west. It is watered in its whole breadth by the Po, which receives a number of rivers and streams descending from the mountains, as the two Doras, the Stura, Orco, Sesia, Tanaro, Borbio, and Varo. In the mountainous regions of the province, the snow and ice remain during a great part of the year; in the plains the climate during winter is temperate, and the heat of summer is moderated by the vicinity of the Alps. Piedmont is considered very fertile, the soil consisting for the most part of a rich sandy loam, which, with extensive irrigation, produces abundant crops of wheat, barley, rye, and maize; and in the lower grounds rice. The hills are in general covered with vineyards, the produce of which is abundant, but not of superior quality. Olives, almonds, chestnuts, figs, oranges, and lemons are also raised. The pastures are extensive, and the rearing of cattle forms one of the chief branches of industry. A still greater is the culture of silk, which is raised in immense quantities, and preferred to all the other silks of Italy. In mineral productions, too, Piedmont is the richest tract in Italy. The principal manufactures are the spinning and weaving of silk; linen, cotton, and woollens, are also made. The exports consist of raw and manufactured silk, cattle, wine, fruit, butter, hides, and wool.

Lady Morgan's lively representation of the first impressions produced by the scenery of Piedmont, on descending the Cottonian Alps, we shall here transcribe:—

'The traveller who ascends from Lans-le-bourg, shivering with cold and shuddering with apprehension, descends into the town of Susa, glowing under the rays of summer suns, and not more intoxicated by their 'soft ethereal warmth' than by the pleasurable consciousness which attends the first arrival in a country unknown and unexplored. The shading off of moral distinctions, the fading of one nation into another, is first observed at the last post-house of Mount Cenis, where the postilions reply to the traveller's questions in a jargon composed of bad French, Italian, and Piedmontese. But nature's distinctions are more broadly marked. Not a trace of the eminently French characteristics of the Savoyards can be found in the population on the Italian side of the mountain.

'The pass of Susa, opening its narrow defile at the foot of the Cottonian Alps, defended by its antique fortress, the Brunetta, was one of infinite importance in days when military tactics were guided by the obstacles or facilities which nature supplied; and it had obtained the name of La chiava d'Italia. The town of Susa, made the capital of Piedmont under its marquises, is small and inconsiderable; but it is striking, not only by a population that seems made up of priests and soldiers, but by the pious frescoes, which cover the walls even of its meanest buildings; converting sties into stations, and hovels into oratories. Many of these were ancient, and not ill-executed; others were new or refreshed, and smacked of the restoration. The façade of one house represented the Virgin and and the angel Gabriel 'in converse sweet,' encircled with fluttering cupids armed with bows. The portico of another exhibited St. Dominick ogling the Magdalen, who lay at his feet. Here St. Peter had his keys new gilt; and there St. Paul his sword new hafted. Every where purgatory, with most corporeal souls burning in flames of most material fire, quickened the penitent or threatened the sinner. Even the trading interests of the town sought the patronage of theology. Death, with his scythe, hung over the shop, whose inscription intimated that qui si vende acqua vita; and prayers for the souls of the dead, and the dying, were solicited over the inn-door, whence the timid traveller departs for the perilous Alps.

'All in this little frontier town, remote and obscure as it lay under the shadows of impending snow-mountains, indicated the vigorous revival of antique state and feudal power; and all the external testimonies of the rule and sway of his Sardinian majesty, which we had left in Savoy (the Ireland of his little monarchy), were quadrupled in the first town of his Piedmontese dominions. Every where the crown glittered over those royal slop-shops so numerous on the continent, where kings, becoming retail dealers, seize the monopoly of powder, tobacco, cards, paper, and salt; and deprive their subjects of the legitimate means of subsistence, and of paying their heavy taxation. Every where the monk prowled, the sentinel challenged, and the police interfered. Even the feudal fortress was reinstated in its ancient array; and the fort of the Brunetta, with its bastions and brown rocks (dismantled by the French) now once more raises its crenelles, and its barbicans, parades its warder, and exhibits its governor as in the days of the Green Count, and Tête de Fer of Savoy. Machiavel has observed that a passion for raising castles and fortresses, in the middle ages, did more injury to society than any other of the disorders of those dark times, 'che alcuno altro disordine di quello stato' (Il Principe). The king of Sardinia is, however, now raising forts on every pinnacle in his Alpine States; and his fort of St. Michael, which was building as we passed through Savoy, on the frightful heights of Mount St. André, at an enormous expense and risk of human lives, will long remain a monument of the efforts made by kings, who, in the nineteenth century, are pretty much what kings were in the ninth. Susa, with all its errors on its head, is reached with delight, and left with regret. It is the first stage in the series of pleasurable sensations; and perhaps both the pleasure and the regret are derived from those very faults which, while they indicate a systematic effort at social retrogradation, give to sites their most picturesque features and distinguished forms.

'The road from Susa to Turin, including a distance of forty miles, lies through a fertile plain, bathed by La Piccola Dora, and occasionally undulated with abrupt hills and high perpendicular rocks, which become gradually smaller, and more remote as the pass opens and the mountains are cleared. These elevations have been seized in former times for the purposes of Church and State, and are covered with dilapidated cloisters and ruined fortresses, that now add much to the beauty of the scenes in which they dominate. The dismantled towers of St. Joire, and the ruined walls of the famous abbey of St. Benedict (the cradle of his order), still fix the upturned eye, and command a valley flowing with milk and honey; while the castle of Avegliana lords the plain above the wretched village, which deforms its base, and was once the dependency of its power. Vines draped round sturdy oaks, groves of mulberries, and fields of young, rich, ripening corn, every where contrast the resources of natural and national prosperity with exhibitions of moral suffering and human infirmity. It is in these laughing vales that beggary assumes its most disgusting form, and that want and penury are not the least evils the wretched have to contend with. As often as we stopped to change horses, groups of miserable beings crawled round, and raised the deafening cry of 'Carità, Elemosina,' in the name of those negligent saints who had abandoned them to every species of physical evil. All the maladies incidental to the Alpine region seemed here accumulated. Some were blind, others devoured with scrofula, and few had their entire complement of limbs and senses. But by far the most shocking objects were the Cretins, here strikingly numerous; and their idiot chatter and wild laugh were more fearful than even maimed limbs and distorted forms. Opposed to these groups usually stood the mistress of the post-house, with a head piled with towers of lace and ribands in all the opulence and pride of the Piedmontese toilet, the spruce gens-d'armes with whom she coquetted, the whiskered corporal of the village detachment quaffing his boccale at the door, and the sleek, sly, well-fed friar again permitted to present his scrip and his benedicite at every gate. While such was the population, the road was the very abstract of all the 'crackskull commons' of Europe; and it put the springs of our carriage so often to the test, that more than once we were obliged to beg the postilions to moderate their pace; a precaution rarely necessary with Italian post-boys. To our suggestions they usually replied, by pointing to a noble line of road marked parallel to our own, with the information of 'Ecco la strada Francese,' 'There is the French road,' which was soon to be finished. This assertion, however, did not appear very probable if we might judge by the way in which the work was carried on. For it was consigned to the labor of a few old men, old women, and little boys, with a wheel-barrow and a shovel for their only implements. The most curious circumstance, however, in this new road was, that some of the nobles whose estates lie contiguous, object to it as French and revolutionary.

'From Rivoli begins a spacious and beautiful avenue, shaded with double rows of lofty trees; it runs for two leagues, through plains of high cultivation, and terminates only at the entrance of Turin, where spires, turrets, and belfries, are caught but at intervals; while the church of the Superga, towering above all, forms the leading point of the brilliant coup-d'œil. As the capital is approached, its splendid position amidst an amphitheatre of vine-covered hills is strikingly picturesque;' but see TURIN.

The population of Piedmont amounts to about 1,750,000, who, with the exception of 20,000 Waldenses, are all Catholics. The inns and accommodations for travellers are poor, and in all the arts of life the inhabitants are backward. They are, however, industrious, and considerable improvements were introduced by the French from 1798 to 1814. In a military sense, Piedmont is strong on the side of France, but exposed on that of Lombardy. Its southern division was in 1794 and 1795 long the scene of undecisive military operations between the French and allies; but in April, 1796, the arrival of Buonaparte brought the French army into the heart of the country, and obliged the court of Turin to make a separate peace. This was followed in the course of two years by the incorporation of Piedmont with France, under the name of the departments of the Stura, Tanaro, Po, Sesia, Dora, Marengo, and Maritime Alps. These divisions were abolished in 1816, and a subdivision into twenty-six districts adopted, viz. Turin, Acqui, Alba, Alessandria, Aosta, Asti, Biella, Casale, Cuneo, Ivrea, Mondovi, Montona, Novara, Palanza, Pignerolo, Saluzzo, Susa, Tortona, Vercelli, Vigeronne, Voghera, Sesia, Domo d'Ossola, Nice, Sospello, Oneglia. See SARDINIA.

PIE'LED, *adj.* Scot. *peild;* Lat. *pilatus.* Having short hair; bald.

Pieled priest, dost thou command me be shut out?
—I do. *Shakspeare. Henry VI.*

PIER, *n. s.* Fr. *pierre.* The column of an arch; any abutment or support; a dam against water.

Oak, cedar, and chesnut are the best builders; for *piers* sometimes wet, sometimes dry, take elm. *Bacon.*

The English took the galley, and drew it to shore, and used stones to reinforce the *pier.* *Hayward.*

The bridge, consisting of four arches, is of the length of six hundred and twenty-two English feet and a half: the dimensions of the arches are as follows, in English measure; the height of the first arch one hundred and nine feet, the distance between the *piers* seventy-two feet and an half; in the second arch the distance of the *piers* is one hundred and thirty feet; in the third the distance is one hundred and nine feet; in the fourth the distance is one hundred and thirty-eight feet. *Arbuthnot.*

PIER, in building, denotes a mass of stone, &c., opposed by way of fortress to the force of the sea, or a river, for the security of ships that lie at harbour in any haven.

PIERS OF A BRIDGE. See BRIDGE.

PIERA, in ancient geography, a fountain of Peloponnesus, between Elis and Olympus. Paus. v. c. 16.

PIERCE, *v. a.* & *v. n.*
PIER'CER, *n. s.*
PIER'CINGLY, *adv.*
PIER'CINGNESS, *n. s.*
Fr. *percer;* Lat. *percieo;* Gr. πειρω. To penetrate; enter by force; make way by force; strike; move; affect; affect deeply: a piercer is a borer or instrument which perforates: the adverb and noun substantive correspond with these senses.

There is that speaketh like the *piercing* of a sword; but the tongue of the wise is health. *Proverbs.*

The love of money is the root of all evil; which while some coveted after, they have *pierced* themselves through with many sorrows. 1 *Tim.* vi. 10.

Cart, ladder, and wimble, with *perser* and pod. *Tusser.*

She would not *pierce* further into his meaning, than himself should declare; so would she interpret all his doings to be accomplished in goodness. *Sidney.*

All men knew Nathaniel to be an Israelite; but our Saviour, *piercing* deeper, giveth further testimony of him than men could have done. *Hooker.*

Steed threatens steed in high and boastful neighs,
Piercing the night's dull ear.
Shakspeare. Henry V.

They provide more *piercing* statutes daily to chain up the door. *Shakspeare.*

Her sighs will make a battery in his breast;
Her tears will *pierce* into a marble heart. *Id.*
Say, she be mute, and will not speak a word;
Then I'll commend her volubility;
And say she uttereth *piercing* eloquence. *Id.*

Short arrows, called sprights, without any other heads, save wood sharpened, were discharged out of muskets, and would *pierce* through the sides of ships where a bullet would not *pierce.* *Bacon's Natural History.*

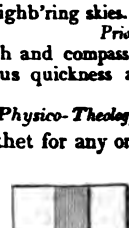
With this fatal sword, on which I died,
I *pierce* her opened back or tender side. *Dryden.*

The hollow instrument, terebra, we may English *piercer*, wherewith many flies are provided, proceeding from the womb, with which they perforate the tegument of leaves, and through the hollow of it inject their eggs into the holes they have made. *Ray.*

The glorious temple shall arise,
And with new lustre *pierce* the neighb'ring skies. *Prior.*

We contemplate the vast reach and compass of our understanding, the prodigious quickness and *piercingness* of its thought. *Derham's Physico-Theology.*

PIERCED, in heraldry, an epithet for any ordinary that is pierced, perforated, or struck through, with a hole in it, so as that the field may be seen. The piercing must be particularly expressed, whether it be square, round, or lozenge, as in the annexed figure, a cross lozenge pierced.



PIERCED is also, in marine affairs, an epithet for a ship capable of receiving guns, as, pierced for 100 guns, &c.

PIERIA, in ancient geography, a district of Macedonia, contained between the mouths of the rivers Ludias and Peneus; extended by Strabo beyond the Ludias, to the Axios on the north, and on the south no farther than the Aliacmon, along the west side of the Sinus Thermaicus.

PIERIA of Syria, the north part of Seleucia, on the Antiochena, situated on the Sinus Issicus, and lying next Cilicia on the north-west.

PIERIDES, in fabulous history, the daughters of Pierus, a Macedonian prince, who, presuming to dispute with the Muses for the prize of poetry, were turned into magpies. They were also called Pæonides.

Pierides, a name of the Muses, from Mount Pieris in Thessaly, which was consecrated to them; or, according to others, from Pierus, a Thessalian poet, who was the first who sacrificed to them. See Pieris.

PIERINO del Vaga, an eminent Italian painter, born of poor parents in Tuscany about the year 1500. He was placed apprentice with a grocer in Florence; but, a painter named Vaga taking him to Rome, he was called Del Vaga, from living with him, his real name being Buonacorsi. After Raphael's death, he joined with Julio Romano and Francis Penni to finish the works in the Vatican, which were left imperfect by their common master; and, to confirm their friendship, married Penni's sister. He gained the highest reputation by his performances in the palace of prince Doria at Genoa; but the multiplicity of his business drained his spirits in the flower of his age; for he died in 1547. Of all Raphael's disciples, Pierino kept the character of his master longest, i. e. his exterior character and manner of designing; for he fell very short of the fineness of Raphael's thinking.

PIERIS, in ancient geography, a mountain which is thought to have given name to Pieria of Macedonia; taking its name from Pierus, a poet, who was the first that sacrificed to the Muses, thence called Pierides.

PIERRE (St. Jaques Henri Bernardin de), was born in 1737 at Havre de Grace, where his parents, who were in easy circumstances, gave him a good education. But he embarked, at the age of twelve years, for Martinique, under the protection of one of his uncles, who commanded a merchant vessel. He soon returned, as he says in one of his letters, 'dissatisfied with his relative, with the sea, and with that island.' He then resumed his studies, and continued them successively at Gisors and at Rouen, under the Jesuits. His parents sent him to Paris to the school of civil engineers. He then entered into a corps of military engineers, and in the following year went to Malta. A quarrel determined him to embark for Holland with the intention of going to Portugal, then at war with Spain; but, an unforeseen obstacle preventing the execution of this design, he offered his services to Peter III. of Russia. He heard of the revolution, which precipitated that unfortunate monarch from the throne at this juncture; nevertheless he pursued his journey, under the idea of finding the empress Catherine at Petersburgh; but on his arrival in that city he learned that she was at Moscow. He accordingly went thither, and obtained a commission as lieutenant in the corps of engineers, which he relinquished at the expiration of eighteen months. He then set out for France by way of Poland. That country was now convulsed by civil wars; he joined the party protected by France, and was taken prisoner by the Russians. Being released in a few days, he resided for some time at Warsaw, then visited Dresden, Berlin, and Vienna, with the intention of entering into the service of some foreign power; but, being unable to make up his mind on the subject, returned to Paris, and sailed for the Isle of France. Here he remained two years; but, the ordinary engineers considering him as an intruder, he quarrelled with them, and solicited and obtained permission to return home. Thus terminated his fruitless peregrinations and military career. At this period he commenced author. In 1773 was published his Voyage to the Isle of France, without his name. The Studies of Nature appeared at the end of 1784, when their author had attained the age of forty-seven years. Like Rousseau, his talents had no dawn, but suddenly burst forth in the full blaze of their splendor; his book was universally read, notwithstanding the well-founded censures of some natural philosophers, whose hostility was roused by his systems; and, in spite of the condemnation of a party, exasperated by his doctrines. The general voice of the public, and the applause of persons of taste, drowned those murmurs; new editions followed in rapid succession; the name of St. Pierre was enrolled among those of the best writers of France, and thenceforward poverty gave place to the comforts of honorable independence. Pensions and rewards now sought the man whom they had formerly shunned. The last lamented monarch of the house of Bourbon spontaneously appointed him intendant of the botanical garden and museum of natural history, with these words, 'I have read your book; it is the production of an honest man; and in you I have provided a worthy successor to M. de Buffon.' Under the Napoleon dynasty he received the cross of the legion of honor; and Joseph Buonaparte bestowed upon him, unsolicited, a pension of 6000 francs. Thus the declining years of St. Pierre were made comfortable; and, as he himself observes, 'his bark, long tossed by the tempest, advanced with propitious gales towards the haven of life.' In the first five years that succeeded the publication of the Studies of Nature, the author was engaged in preparing farther developments of his subject. He arranged his ideas slowly and leisurely; and, gradually disencumbering them of their first dress, at length clothed them in that delicate, picturesque, harmonious, and brilliant language which constitutes the charm of his works. This patient attention to the finishing of his compositions caused him to keep back, for several years, his Paul and Virginia, which he copied over seven or eight times. It was not published till 1789. Nearly at the same period he gave to the world the tale of the Indian Cottage, a production of a different stamp, in which satire was happily blended with that exquisite feeling for the physical and moral beauties of nature which pervades all the works of M. de St. Pierre. The fragments of the Arcadia, which he left unfinished, afforded the means of forming a complete idea of the original talents which he displayed as a painter and a colorist. He left behind him Harmonies of Nature, partly finished; Memoirs of his Life, and a number of irregular dramas, and other sallies of imagination. He died 21st July, 1814.

Pierre (St. Eustace de), a brave French patriot, who devoted his life to save his country, at the celebrated siege of Calais, under our Edward III.

Pierre (St.), a seaport town of Martinico, in the West Indies, situated at the west coast of the island, five leagues south of Fort Royal. It is a port of entry, and the centre of considerable business. It has been four times burnt down, and contains at present about 2000 houses. The anchorage ground is along the sea-side, on the strand. Another part of the town is separated from this by a river, and the houses are built on a low hill, which is called the fort, from a small fortress which defends the road.

PIERUS, the father of the nine Pierides.

Pierus, in geography, 1. A mountain of Thessaly sacred to the Muses; 2. A town of Thessaly (Paus. vii. 22); 3. A river of Peloponnesus; 4, 5. A mountain and lake of Macedonia.

PIESTRUM, from πιεζω, to press. In midwifery, an instrument to compress the head of a dead fœtus, for its more easy extraction from the womb.

PIETAS, a deity of the Romans. See Piety.

PIETISTS, a religious sect among the Protestants of Germany, a kind of mean between the Quakers of England and the Quietists of the Romish church. They despise all sorts of ecclesiastical polity, school theology, and forms and ceremonies, and give themselves up to contemplation and mystic theology. Many gross errors are charged on the Pietists, in a book entitled Manipulus Observationum Antipietisticarum: but they have the air of polemical exaggeration. Indeed there are Pietists of various kinds: some running into gross illusions, and carrying their errors to the overturning of a great part of the Christian doctrine, while others are only visionaries. *See Mosheim's Ecclesiastical History*, vol. iv.

Pietists, otherwise called the Brethren and Sisters of the Pious and Christian Schools, a society formed in the year 1678 by Nicholas Barre, and obliged by their engagements to devote themselves to the education of poor children of both sexes.

PIETRO (St.), the ancient Hieracum, a populous though small island of the Mediterranean, on the south-west coast of Sardinia, near St. Antioco, and ten miles distant from the town of Iglesia, in Sardinia. It is well cultivated; but the inhabitants are chiefly employed in fishing, and making bay-salt. The chief place is Carlo Forte, which has a castle.

PI'ETY, *n. s.*
Pi'ous, *adj.*
Pi'ously, *adv.*
} Fr. *piété*; Ital. *pieta*; Sp. *piedad*; Lat. *pietas*, *pius*, qu. dius à deus, vel à Gr. διος, Cret. θεος, Ainsworth. Devotion; duty to God; godliness; reverence for the Heathen deities; patriotism; duty to parents or seniors: pious and piously follow all these senses.

What *piety*, pity, fortitude did Æneas possess beyond his companions? *Peacham on Poetry.*

I shall never gratify spightfulness with any sinister thoughts of all whom *pious* frauds have seduced. *King Charles.*

The prime act and evidence of the christian hope is, to set industriously and *piously* to the performance of that condition, on which the promise is made. *Hammond.*

As he is not called a just father that educates his children well, but *pious*; so that prince, who defends and well rules his people, is religious. *Taylor's Rule of Living Holy.*

There be who faith prefer and *piety* to God. *Milton.*

Pious awe that feared to have offended. *Id.*

Learn
True patience, and to temper joy with fear
And *pious* sorrow. *Id.*

This martial present *piously* designed,
The loyal city give their best loved king. *Dryden.*

See lion-hearted Richard, with his force
Drawn from the North, to Jury's hallowed plains;
Piously valiant. *Philips.*

Let freedom never perish in your hands!
But *piously* transmit it to your children. *Addison.*

'Till future infancy, baptized by thee,
Grow ripe in years, and old in *piety*. *Prior.*

Where was the martial brother's *pious* care?
Condemned perhaps some foreign shore to tread. *Pope.*

Pope's filial *piety* excels
Whatever Grecian story tells. *Swift.*

Praying for them would make them as glad to see their servants eminent in *piety* as themselves. *Law.*

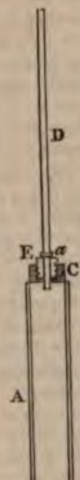
It would effectually prevent that bad disposition which is too apt to steal upon and infect some of the best human minds (especially those who aim at singular and exalted degrees of *piety*). *Mason.*

True *piety* is cheerful as the day,
Will weep indeed and heave a pitying groan
For others' woes, but smiles upon her own. *Cowper.*

Piety is the virtue of veneration for the Deity, and love and tenderness to our friends. This distinguished virtue, like many others, received among the Romans divine honors, and was one of their deities. Acilius Glabrio first erected a temple to this divinity, which he did upon the spot on which a woman had fed with her own milk her aged father, who had been imprisoned by order of the senate, and deprived of all aliments. The story is well known. If piety was thus practised and thus honored in Heathen antiquity, it ought not to be less so among Christians, to whom its nature is better defined, and to the practice of which they have motives of greater cogency.

Piety, Lat. pietas, in allegorical painting and sculpture. Pietas, as the goddess of devotion, is represented as veiled, and casting incense on an altar. The Romans, in their solemn devotions, covered their heads with a long veil.—Ovid, Fast l. iii. v. 364. Lucr. v. v. 1198. The vestal virgins were, therefore, always veiled.

PIEZOMETER. This is an instrument invented by Mr. Perkins for ascertaining the compressibility of water. Having originally filled a cylinder, three feet long and four inches diameter, with water, into which a rod or piston was passed through a stuffing box, and having a sliding ring upon the rod, the whole was lowered 500 fathoms into the sea, when it appeared, by the situation of the sliding ring, that the column of water, which pressed upon the piston, had sunk it so as to have compressed the water one hundredth part of its bulk. The same apparatus was placed in a cannon filled with water, and secured very tight, when a pressure equal to 500 fathoms, was forced in by means of the hydraulic press, and the same results as in the experiment in the ocean took place. The following is a more detailed account of the instrument he finally employed, abridged from the Philosophisal Transactions, 1820, p. ii.



The end B, see diagram, of a cylinder A, three inches wide and eighteen long, being made water-tight by a plate firmly soldered to it, a cap C, also water-tight, was made to screw on and off. The rod D, $\frac{5}{16}$ of an inch in diameter, and carrying a flexible ring *a*, was made to pass through a tight stuffing box E. A cannon D, fig. 12, capable of containing the piezometer, was fixed vertically in the earth, the touch-hole being plugged tight, and the muzzle about eighteen inches above ground. A strong cap, A, was firmly screwed on at the mouth, and in the centre of it a small forcing pump B, with a piston five-eighths of an inch in diameter, was tightly screwed. A valve was introduced at the aperture C, to ascertain the degree of pressure, one pound of pressure on that valve indicating an atmosphere. The piezometer being introduced into the cannon, the water was forced in till the cap showed signs of leakage, the valve at the same time indicating a pressure of 100 atmospheres. When the piezometer was taken out of the cannon, the flexible ring *a* was eight inches up the rod D, which proved that the rod had been forced that length into the cylinder, and that the compression was about one per cent. In order to produce this compression, three per cent. must be pumped into the gun, an effect arising from the expansion of the gun, or the entrance of the water into the pores of the cast-iron. On his voyage to England, Mr. Perkins repeated this experiment frequently, and with the same result, by sinking the piezometer with fifty-four pounds of lead, to the depth of 500 fathoms, which gives nearly a pressure of 100 atmospheres.

Being satisfied that the above piezometer would not show all the compression, he made another, consisting of a small tube, closed at the lower end, and water-tight. At the upper end the water entered through a small aperture, closed by a sensible valve opening inwards. It was then perfectly filled with water (the weight of which was accurately known), and subjected in a hydraulic press to a pressure of about 326 atmospheres. When taken out and weighed, there was found an increase of water amounting to three and a half per cent. This water had been previously boiled, and cooled down 48°, and kept at that temperature during the experiment, which was performed before many scientific individuals. Mr. Perkins made several curious experiments, by sinking strong empty porter bottles to different depths; but we must refer for an account of these to the Philosophical Transactions, as they do not contain any very precise results.

PIG, *n. s.* Sax. þic; Belg. *bigge*. A young sow or boar; an oblong mass of lead or unforged metal, or sodden ore. See Sow.

> Some men there are love not a gaping *pig*,
> Some that are mad, if they behold a cat.
> *Shakspeare.*
>
> Alba, from the white sow named,
> That for her thirty sucking *pigs* was famed.
> *Dryden.*

The flesh-meats of an easy digestion are *pig*, lamb, rabbit, and chicken. *Flower on the Humours.*

> A nodding beam, or *pig* of lead,
> May hurt the very ablest head. *Pope.*

PIG, in zoology. See SUS.

PIG, GUINEA. See CAVIA.

PIG IRON. See IRON.

PIG OF LEAD, the eighth part of a fother, amounting to 250lbs. weight.

PIGALLE (John Baptist), a celebrated sculptor, born at Paris in 1714. He became chancellor of the academy of painting and knight of St. Michael. He went to Italy, and returned inspired with the genius of the great artists. His most valued works are a Mercury and a Venus, which he made by order of Louis XV., as presents to the king of Prussia. He also carved a statue of Voltaire, with many other admired pieces. He died at Paris in 1785.

PIGANIOL DE LA FORCE, (John Aymar de), a native of Auvergne, of a noble family, who applied himself with ardor to the study of geography, and of the history of France. He also travelled for improvement. His chief works are, 1. An Historical and Geographical Description of France; the largest edition is that of 1753, in 15 vols. 12mo. 2. A Description of Paris, in 10 vols. 12mo.; of which he published an abridgment, in 2 vols. 12mo. 3. A Description of the Castle and Park of Versailles, Marly, &c., in 2 vols. 12mo. Piganiol had also a concern with abbé Nadal in the Journal of Trevoux. He died at Paris in February, 1753, aged eighty. He was as much respected for his manners as for his talents. To a profound and varied knowledge he united a great probity and honor, and all the politeness of a courtier.

PIG'EON, *n. s.*
PIG'EON-LIVERED, *adj.* } Fr. *pigeon*; Ital. *piccione*, qu. Latin *pipio?* A fowl; the COLUMBA of Linnæus, which see: pigeon-livered means mild, gentle, and sometimes cowardly, or tame, like this bird.

> A turtle dove and a young *pigeon*.
> *Genesis* xv. 9.
>
> This fellow picks up wit as *pigeons* peas.
> *Shakspeare.*
>
> I am *pigeonlivered*, and lack gall.
> To make oppression bitter. *Id. Hamlet.*

Perceiving that the *pigeon* had lost a piece of her tail, through the next opening of the rocks rowing with all their might, they passed safe, only the end of their poop was bruised. *Raleigh.*

> Fixed in the mast, the feathered weapon stands,
> The fearful *pigeon* flutters in her bands. *Dryden.*

See the Cupola of St. Paul's covered with both sexes, like the outside of a *pigeon*-house. *Addison.*

> This building was designed a model,
> Or of a *pigeon*-house or oven,
> To bake one loaf, or keep one dove in. *Swift.*

PIGEON, in ornithology, see COLUMBA. The varieties of the common pigeon, enumerated by Linnæus, amount to twenty-one; but those of the pigeon fanciers to more than double that number. The ring-dove (C. palumbus, L.), and the turtle-dove (C. turtur), with the greater number of the varieties, are cultivated only by a few persons known as pigeon fanciers: but the common pigeon of different colors is cultivated for the table. The flesh of the young is very savory and stimulating, and highly valued for pies; that of the full aged pigeon is more substantial, harder of digestion, and heating. Black or dark feathered pigeons are dark fleshed, and of high flavor, inclining to the game bitter of the wild pigeon. Light colored feathers denote light and delicate flesh. The dung of pigeons is used for tanning upper leathers for shoes; it is also an excellent manure. It is so highly prized in Persia that many pigeon-houses are erected at a distance from habitations for the sole purpose of collecting this manure. They are large round towers, broader at the bottom than at the top, and crowned by conical spiracles through which the pigeons descend. Their interior resembles a honeycomb, forming thousands of holes for nests; and the outsides are painted and ornamented. The dung is applied almost entirely to the rearing of melons, a fruit most rapidly raised in scarce seasons; and hence the reason that during the famine of Samaria a cab of dove's dung was sold for five pieces of silver. (2 Kings vi. 25). The Persians do not eat the bird. Pigeons are now much less cultivated than formerly, being found injurious to corn fields, and especipally to fields of peas. They are, however, very ornamental; a few may be kept by most farmers, and fed with the common poultry, and some who breed domestic fowls on a large scale may, perhaps, find it worth while to add the pigeon to their number. The gray pigeon is most suitable for the common pigeon-house; it generally shows fruitfulness by the redness of the eyes and feet, and by the ring of gold color which is about the neck.

Stocking of pigeon-houses is best performed in May or August, as the birds are then in the best condition. Young birds called squeakers should be chosen, as the old are apt to fly away. The pigeon lays in breeding two white eggs, which produce young ones of different sexes. When the eggs are laid, the female sits fifteen days, not including the three days she is employed in laying, and is relieved at intervals by the male. The turns are generally pretty regular. The female usually sits from about five in the evening till nine the next morning; at which time the male supplies her place, while she is seeking refreshment abroad. Thus they sit alternately till the young are hatched. If the female does not return at the expected time, the male seeks her, and drives her to the nest; and, should he in his turn be neglectful, she retaliates with equal severity. When the young ones are hatched, they only require warmth for the first three days; a task which the female takes entirely upon herself, and never leaves them except for a few minutes to take a little food. After this they are fed about ten days with what t e old ones have picked up in the fields, and kept treasured in their crops, whence they satisfy the craving appetite of their young ones, who receive it very greedily. This way of supplying the young with food from the crop, in birds of the pigeon-kind, differs from all others. The pigeon has the largest crop of any bird, for its size; which is also quite peculiar to the kind. In two that were dissected by an eminent anatomist it was found that, upon blowing the air into the windpipe, it distended the crop or gullet to an enormous size. Pigeons live entirely upon grain and water; these, being mixed together in the crop, are digested in proportion as the bird lays in its provisions. Young pigeons are very ravenous, which necessitates the old ones to lay in a more plentiful supply than ordinary, and to give it a sort of half maceration in the crop, to make it fit for their tender stomachs. The numerous glands, assisted by air and the heat of the bird's body, are the necessary apparatus for secreting a sort of pap, or milky fluid (commonly called pigeon's milk), but as the food macerates, it also swells, and the crop is considerably dilated. If the crop were filled with solid substances, the bird could not contract it; but it is obvious the bird has the power to compress its crop at pleasure, and, by discharging the air, can drive the food out also, which is forced up the gullet with great ease. The young usually receives this tribute of affection from the crop three times a day. The male for the most part feeds the young female, and the old female performs the same service for the young male. While the young are weak, the old ones supply them with food macerated suitably to their tender frame; but, as they gain strength, the parents give it less preparation, and at last drive them out, when a craving appetite obliges them to shift for themselves; for, when pigeons have plenty of food, they do not wait for the total dismission of their young; it being a common thing to see young ones fledged, and eggs hatching at the same time and in the same nest. Pigeons are granivorous, and very delicate and cleanly in their diet; they will sometimes eat green aromatic vegetables, but are fondest of seeds; and tares, and the smallest kind of horse-beans, are the most suitable food both in point of economy and fattening qualities.

Pease, wheat, buck-wheat, and even barley oats, &c., are also eaten by pigeons, but old tares may be reckoned their best food, says Mr. Loudon; new tares, pease, or beans, are reckoned scouring. Wherever pigeons are kept, the best way to keep them chiefly at home, and thereby both prevent their being lost and their doing injury to corn-crops, is to feed them well; this is also the only way in which, in modern times, they will afford abundance of fat and delicate squabs for the table, which, well fed, they will do every month in the year, and thus afford a constant supply of delicate stimulating food. Pigeons are generally fed in the open air adjoining their cote or house; but in inclement weather, or to attach new pigeons to their home, both food and water should be given alternately. That this may be done without waste, and without frequently disturbing the birds, two contrivances are in use; the first is the meat-box or hopper, whence grain or pulse descends from the hopper as eaten out of a small shallow box; the next is the water-bottle, an ovate, long, naked bottle, reversed in a small basin to which it serves as a reservoir. Any bottle will do, but the pigeons are apt to alight on and dirty such as when reversed present a flat top. Pigeons being fond of salt, what is called a pigeon-cat is often placed in the midst of the pigeon-house, or in the open air near it. It seems these birds are fond of salt and hot substances, and constantly swallow small stones to promote digestion. The salt-cat is thus composed: gravel or drift-sand, unctuous loam, the rubbish of an old wall, or lime, a gallon of each; should lime be substituted for rubbish, a less quantity of the former will suffice; one pound of cummin-seed, one handful of bay-salt; mix with stale urine. Enclose this in jars, corked or stopped, holes being punched in the sides, to admit the beaks of the pigeons. These may be placed abroad. They are very fond of this mixture, and it prevents them from pecking the mortar from the roofs of their houses, which they are otherwise very apt to do. Cleanliness is one of the first and most important considerations in a dove-cote.

They are of three kinds, small boarded cases fixed on posts, trees, or against the ends of houses: lofts fitted up with holes or nests; and detached buildings. 'The first are generally too small to contain a sufficient brood, and are also too subject to variations of temperature; and the last, on the other hand, are now-a-days too large, and therefore the most suitable for the farmer is a loft or tower rising from a building in which no noisy operation is carried on. The lofts of any of the farm-buildings at a distance from the threshing-machine are suitable, or a loft or tower over any detached building will answer well; but the best situation of all is a tower raised from the range of poultry-buildings, where there is such a range, as the pigeons can thus be more conveniently treated, and will feed very readily with domestic poultry. For a tower of this sort, the round form should be preferred to the square; because the rats cannot so easily come at them in the former as in the latter. It is also much more commodious; as, by means of a ladder turning round upon an axis, it is possible to visit all the nests in the house, without the least difficulty; which cannot be so easily done in a house of the square form. And in order to hinder rats from climbing up the outside of it, the wall should be covered with tin-plates to a certain height, as about a foot and a half; which should project out three or four inches at the top, to prevent more effectually their getting up. A common mode in France is to raise a boarded room on a strong post, powerfully braced, the interior sides of which are lined with boxes for the birds, and the exterior east and west sides with balconies, or sills for them to alight on and enter to their boxes. The north and south sides are lined with boxes inside, but without openings, as being too cold on the one front, and too warm on the other. The interior must be lined with nests or holes, subdivided either by stone, as in the ancient mural pigeon-houses; by boards; or each nest composed of a vase or vessel of earthenware fixed on its side. Horizontal shelves divided vertically at three feet distance, are generally esteemed preferable to every other mode.

Pigeons are protected by the legislature. By the 1 James, c. 27, whosoever shall shoot at, kill, or destroy, any dove or pigeon, with any gun or bow, or take, kill, or destroy the same with setting dogs or nets, or any snares, engines, or instruments whatsoever, shall, on being convicted before two justices, by confession, or oath of two witnesses, be commited to gaol for three months, or pay for the use of the poor 20*s.* for every pigeon; or, after this commitment become bound by recognizance, with two sureties, before two justices, in £20 each, not to offend in like manner again. And by the 2 Geo. III. c. 29, any person who shall shoot at, or by any means kill or take, with a wilful intent to destroy, any pigeon, he shall on conviction thereof, by confession, or oath of one witness, before one justice, forfeit 20*s.* to the prosecutor; and, if not immediately paid, such justice shall commit him to the house of correction, for any term not exceeding three months, nor less than one, unless the penalty be sooner paid. Persons who are convicted on this act shall not be convicted by any former act, and prosecutions on this act must be commenced within two months after the offence was committed. These two abstracts are given to inform the keepers of pigeons of the laws in force to protect them; but more especially to remove the vulgar error, so prevalent among the lower class of people, that pigeons are a nuisance, that they destroy a great deal of seed in the fields, grain in the rick-yards, and loosen the tiles on the tops of buildings; and that any person may shoot them, provided that he does not carry them away.

Pigeon (Peter Charles Francis), curate and afterwards rector or vicar of Bayeux, one of the numberless victims who fell a sacrifice to Jacobin rage and infidelity, in the beginning of the French revolution. Although a man of not only sincere piety, but of uncommon mildness and humanity, yet, because he refused to take the oaths imposed by the republicans, he and his family were at first insulted and persecuted in the cruellest manner, and he himself was at last murdered on the 20th of August, 1793, in his thirty-eighth year.

Pigeon Pea. See Cytisus.

Pigeon Foot is a species of geranium.

PIGHIUS (Stephen Vinand), a learned antiquary, born at Campen in Overyssel, in 1520. He went to Rome, and was patronised by cardinal Granvelle, who made him his librarian. The learned are indebted to him for the first good edition of Valerius Maximus, in 1585, 8vo. He became preceptor to prince Charles of Juliers, who dying, he wrote a panegyric upon him, on which his father, prince William, made him canon of Santen, where he died in 1604, aged eighty-four. His Annales, seu Fasti Romanorum Magistratuum et Provinciarum, were published by Schottus in 1615, in 3 vols. folio.

PIGHT, old preter. and part. pass. of pitch. See Pitch.

PIG'MENT, *n. s.* Lat. *pigmentum.* Paint; color to be laid on any body.

Consider about the opacity of the corpuscles of black *pigments*, and the comparative diaphaneity of white bodies. *Boyle.*

PIGMENTUM, from *pingo*, to paint, pigment. This name is given by anatomists to a mucous substance found in the eye, which is of two kinds. The pigment of the iris is that which covers the anterior and posterior surface of the iris, and gives the beautiful variety of color in the eyes. The pigment of the choroid membrane is a black or brownish mucus, which covers the anterior surface of the choroid membrane, contiguous to the retina and the anterior surface of the ciliary processes.

PIGMY, *n. s.* Fr. *pigmée*; Lat. *pygmæus*; Gr. πυγμαιος. A small nation, fabled to be devoured by the cranes; thence any thing mean or inconsiderable.

Of so low a stature, that, in relation to the other, they appear as *pigmies*. *Heylin.*

When cranes invade, his little sword and shield
The *pigmy* takes. *Dryden's Juvenal.*

The criticks of a more exalted taste, may discover such beauties in the ancient poetry, as may escape the comprehension of us *pigmies* of a more limited genius. *Garth.*

But that it wanted room,
It might have been a *pigmy's* tomb. *Swift.*

PIGNEAUX (N.), late bishop of Audran, was born in the department of the Aisne, in France, 1740. He went in 1770, with the authority of the pope, as a missionary to Cochin China, and gained the esteem of the king, Caung-Schung, who confided to him the education of his only son. The troubles which disturbed the empire of his protector, obliged him to fly to the town of Sat-Gond, whence he proposed invoking the assistance of France. The king had been surprised by three ambitious brothers, who overthrew his empire and forced him to seek an asylum in the isle of Pulo-Wa. In 1787 the bishop departed for France, taking his pupil with him, and formed an offensive and defensive league between France and Cochin China, returning with the title of ambassador extraordinary to that kingdom. Before his arrival in Cochin China, the Revolution broke out, and all help was refused him. Still he did not lose his courage, but, going to the isle of Pula-Wa, brought thence Caung-Schung, who, profiting by the discontent of his subjects, regained his empire in 1790. He now created Pigneaux his first minister, and under his direction founded several manufactories. The bishop translated for him a Treatise on Tactics, instituted schools, to which fathers of families were obliged to send their children at the age of four years, and died in 1800, when Caung-Schung caused him to be interred with the highest funeral honors of the Cochin-Chinese.

PIGNORIUS (Lawrence), a learned Italian, born at Padua in 1571, and bred an ecclesiastic. He made deep researches into antiquity, and published several curious works in Italian and Latin, particularly Mensa Isiaca, on the antiquities of Egypt. The great Galileo procured him the offer of a professorship at Pisa, but he declined it. In 1630 he was made a canon in Treviso, but died of the plague in 1631.

PIG'NUT, *n. s.* Pig and nut. An earth nut.

I with my long nails will dig thee *pignuts*.
Shakspeare.

PIGS'NEY, *n. s.* Sax. þiʒa, a girl. A word of endearment to a girl. It is used by Butler for the eye of a woman, 'I believe, says Johnson, improperly.'

Shine upon me but benignly
With that one, and that other *pigsney*.
Hudibras.

PIGUS, in ichthyology, a species of leather-mouthed fish, very much resembling the common carp; being of the same shape and size, and its eyes, fins, and fleshy palate, exactly the same; from the gills to the tail there is a crooked dotted line; the back and sides are bluish, and the belly reddish. It is covered with large scales, from the middle of each of which there rises a fine pellucid prickle, which is very sharp. It is an excellent fish for the table, being perhaps preferable to the carp: and it is in season in the months of March and April. It is caught in lakes in some parts of Italy, and is mentioned by Pliny, though without a name. Artedi says it is a species of cyprinus, and he styles it the cyprinus called piclo and pigus.

PIGWID'GEON, *n. s.* Used by Drayton as the name of a fairy, and is a kind of cant word for any thing petty or small.

Where is the Stoick can his wrath appease,
To see his country sick of Pym's disease;
By Scotch invasion to be made a prey
To such *pigwidgeon* myrmidons as they?
Cleaveland.

PI-HAHIROTH, a mouth or narrow pass between two mountains, called Chiroth or Eiroth, and lying not far from the bottom of the west coast of the Arabian Gulph; before which the children of Israel encamped, just before their entering the Red Sea.

PIISSKER, in ichthyology, is a fish of the mustela kind, commonly called the fossil mustela, or fossil fish. They are generally found as long as a man's hand is broad, and as thick as one's finger; but they sometimes grow much longer: the back is gray with a number of spots and traverse streaks, partly black and partly blue; the belly is yellow, and spotted with red, white, and black; the white are the larger, the others look as if they were made with the point of a needle; and there is on each side a longitudinal black and white line. There are some fleshy excrescences at the mouth, which are expanded in swimming, but contracted when out of the water. These fishes run into caverns of the earth, in the sides of rivers, in marshy places, and penetrate a great way, and are often dug up at a distance from waters. Often, when the waters of brooks and rivers swell beyond their banks, and again cover them, they make their way out of the earth into the water; and, when it deserts them, they are often left in vast numbers upon the ground, and become a prey to swine. It is thought to be much of the same kind with the fisgum fish; and it is indeed possible that the pæcilia of Schonefeldt is the same.

PIKE, *n. s.* Fr. *picque*, 'his snout being sharp.' Skinner and Junius. The popular name of the esox lucius.

The luce or *pike* is the tyrant of the fresh waters: Sir Francis Bacon observes the *pike* to be the longest lived of any fresh water fish, and yet he computes it


CARIBBEAN SEA
NORTH
ATLANTIC OCEAN
COLUMBIA
GUIANA
Martinico
S.t Lucia
Barbadoes
Margarita
Tobago
Trinidad
Maracaibo
R. Orinoco
Angostura
Georgetown
Paramaribo
R. Essequibo
Cayenne
R. Guaviara
R. Orinoco
R. Negro
Japura R.
Equator
North Amazon
Riv. Maranon
Amazon R.
SOLIMOENS
Obidos
Santarem
MARANHAM
Maranham
PARA
RIO GRANDE
PARAIBA
Paraiba
Pernambuco
S. Roque
Natal
Fernando de Noronha
PERU
Campos Parexis
Tapajos or Topayo
Barcellas
Ega
75
70
65
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55
50
45
40
35
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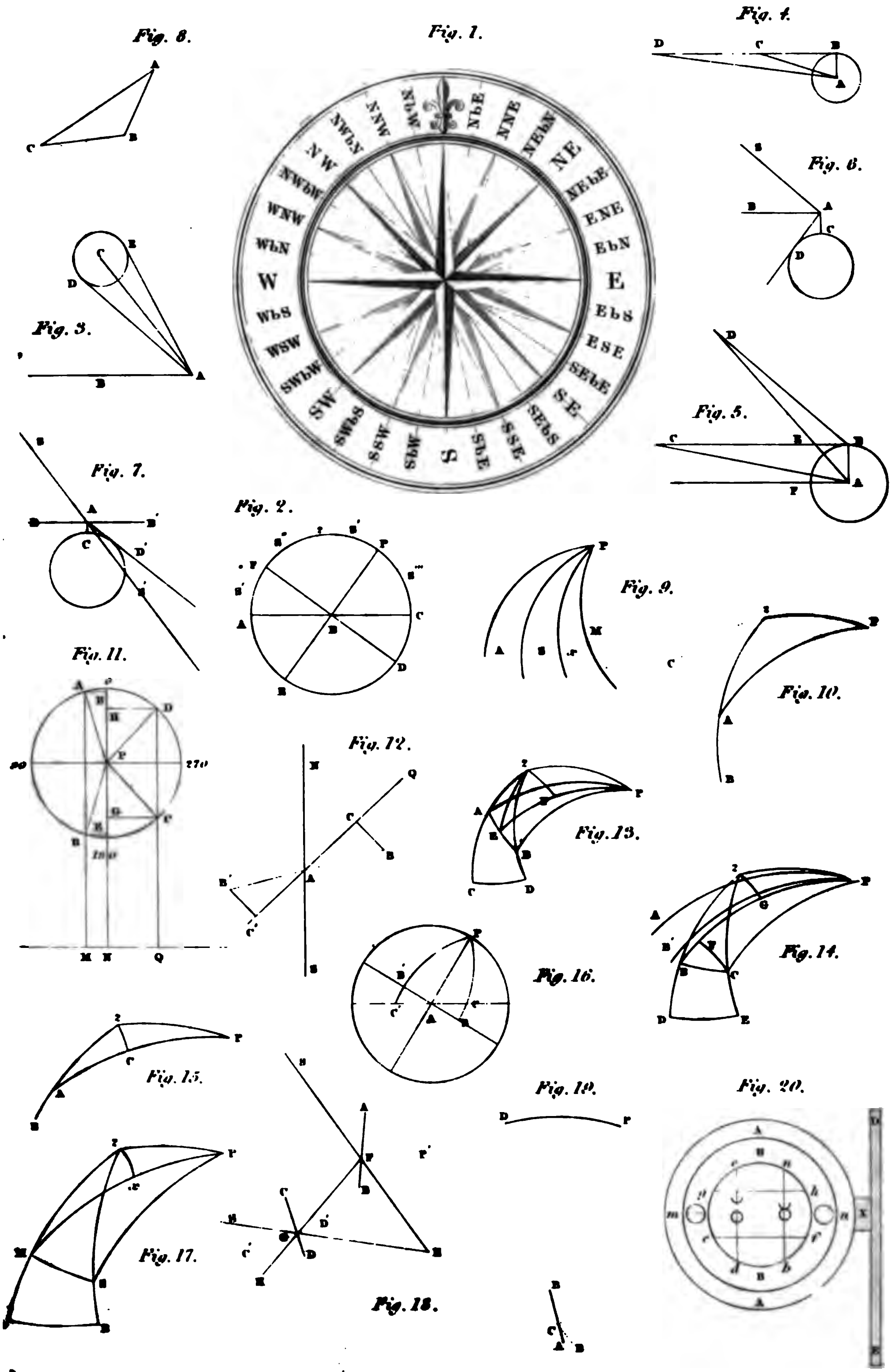
Drawn by J. Assheton.

Engraved on Steel by J. Shury.

London, Published by Thomas Tegg, 73, Cheapside, September, 1,1828.



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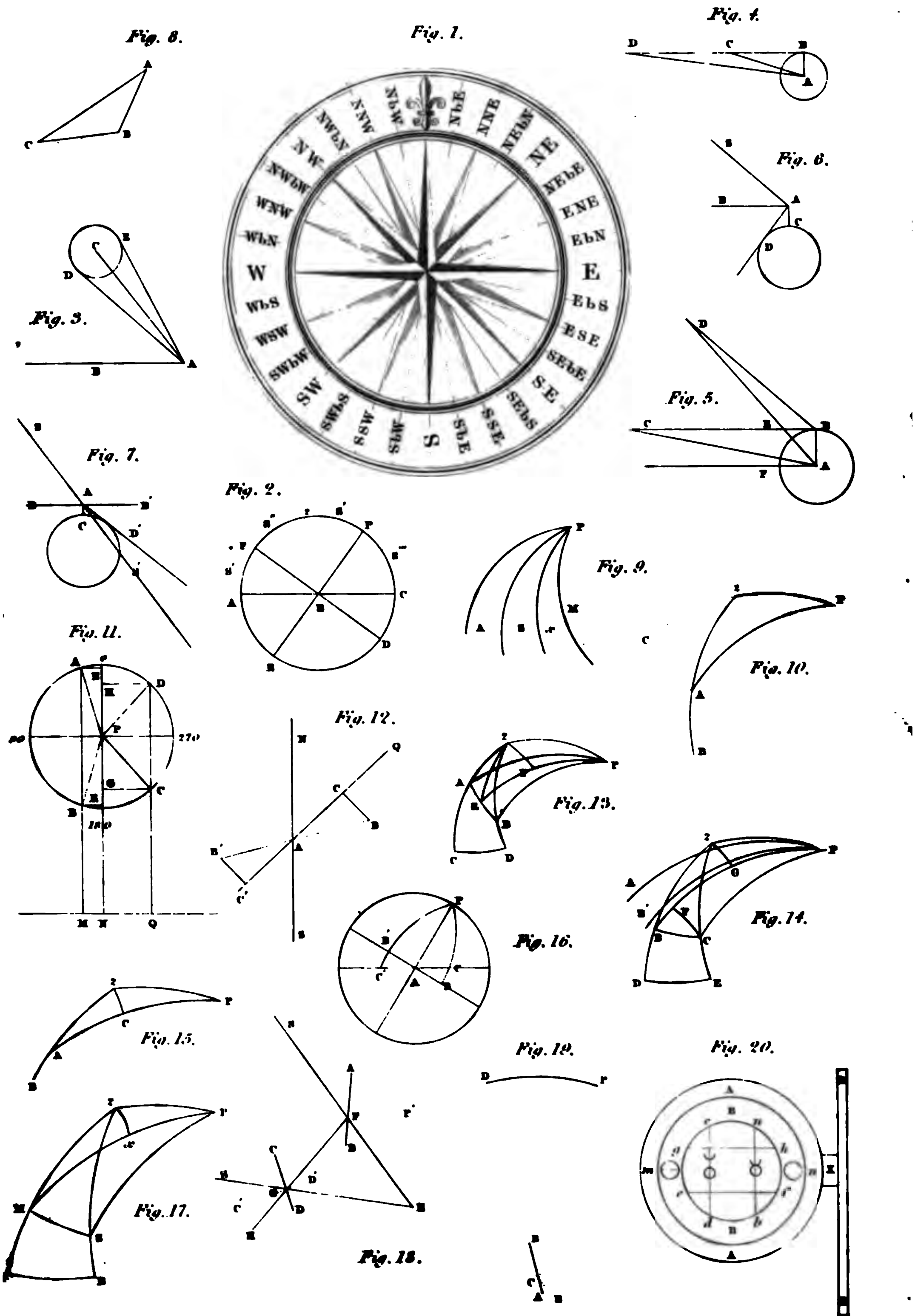
NAVIGATION.

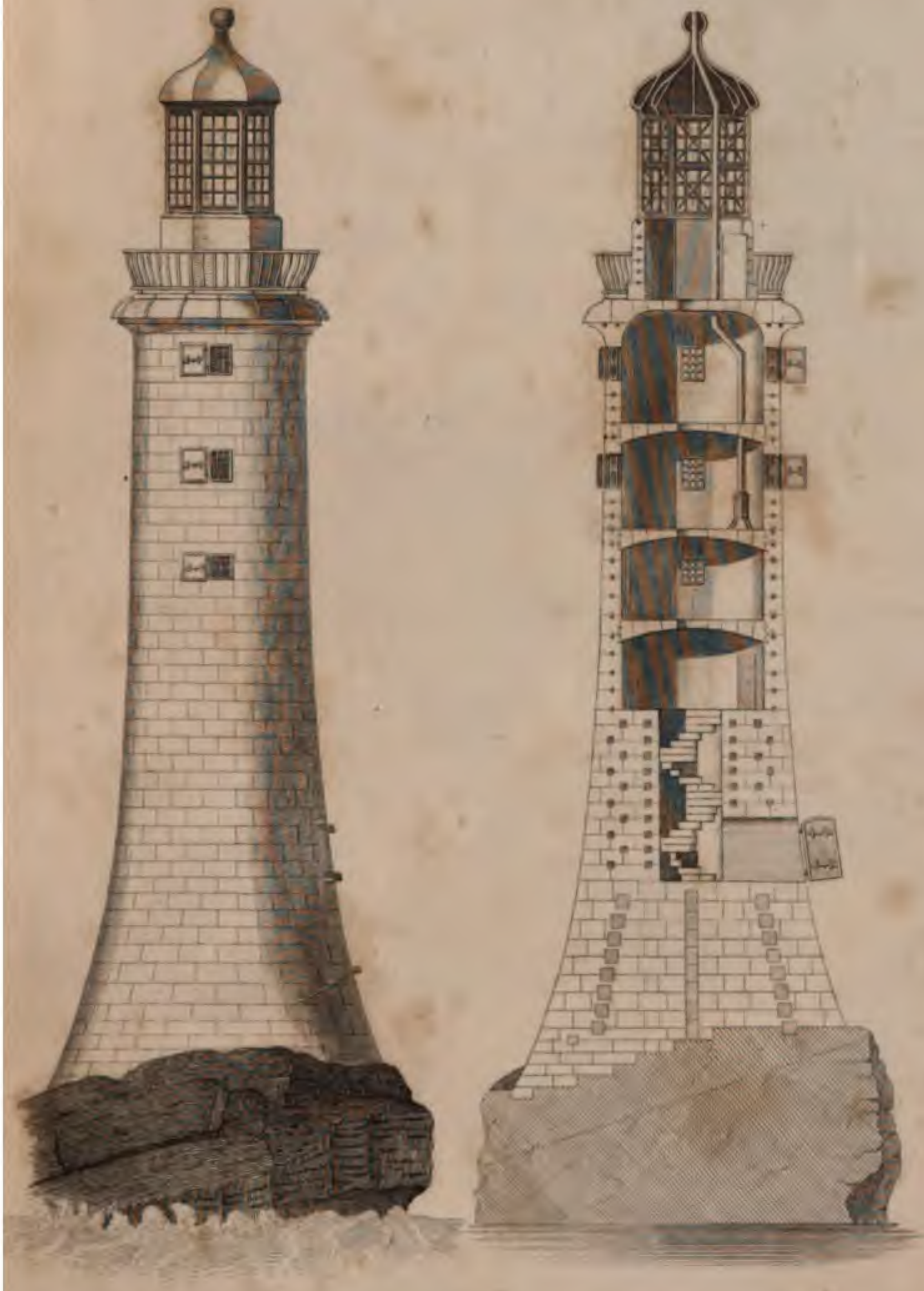


London, Published by Thomas Tegg, 73 Cheapside, Sept 1. 1828.

J. Shury Sc.

LIGHT-HOUSE.

Eddystone Rock Light-House.



Scale of Feet.

5 0 5 10 15 20 25

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J. Shury sculp.

MNEMONICS.

Fig. 1. *(Cabinet or Associatore Key.)*

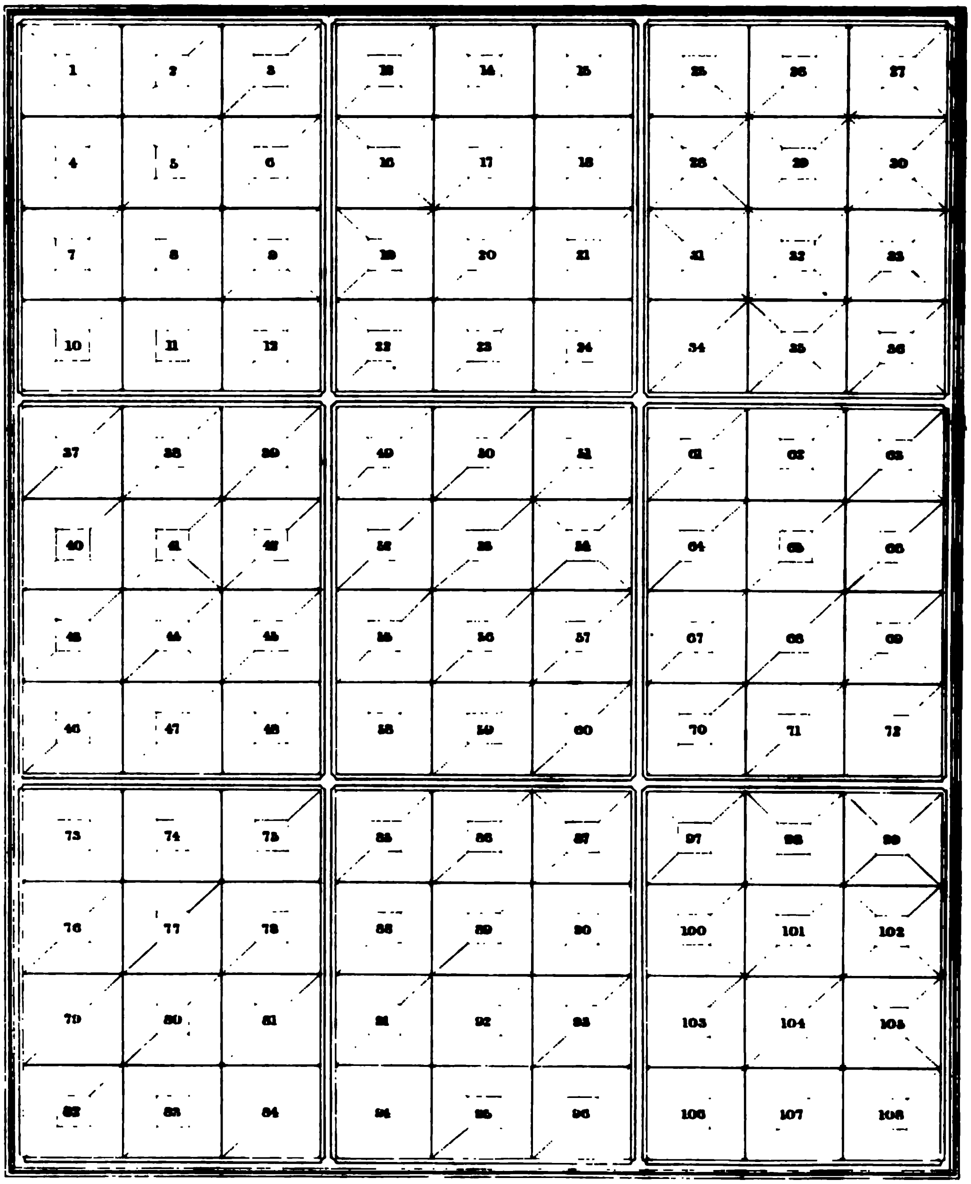

Fig. 2. *(Numerical Key.)*

1 AB	4 OE	7 OI P	100 G
2 ED	5 UL	8 OO R	0 YZ
3 IT	6 AU S	9 OU X	1000 T-H

J. Shury Sc.

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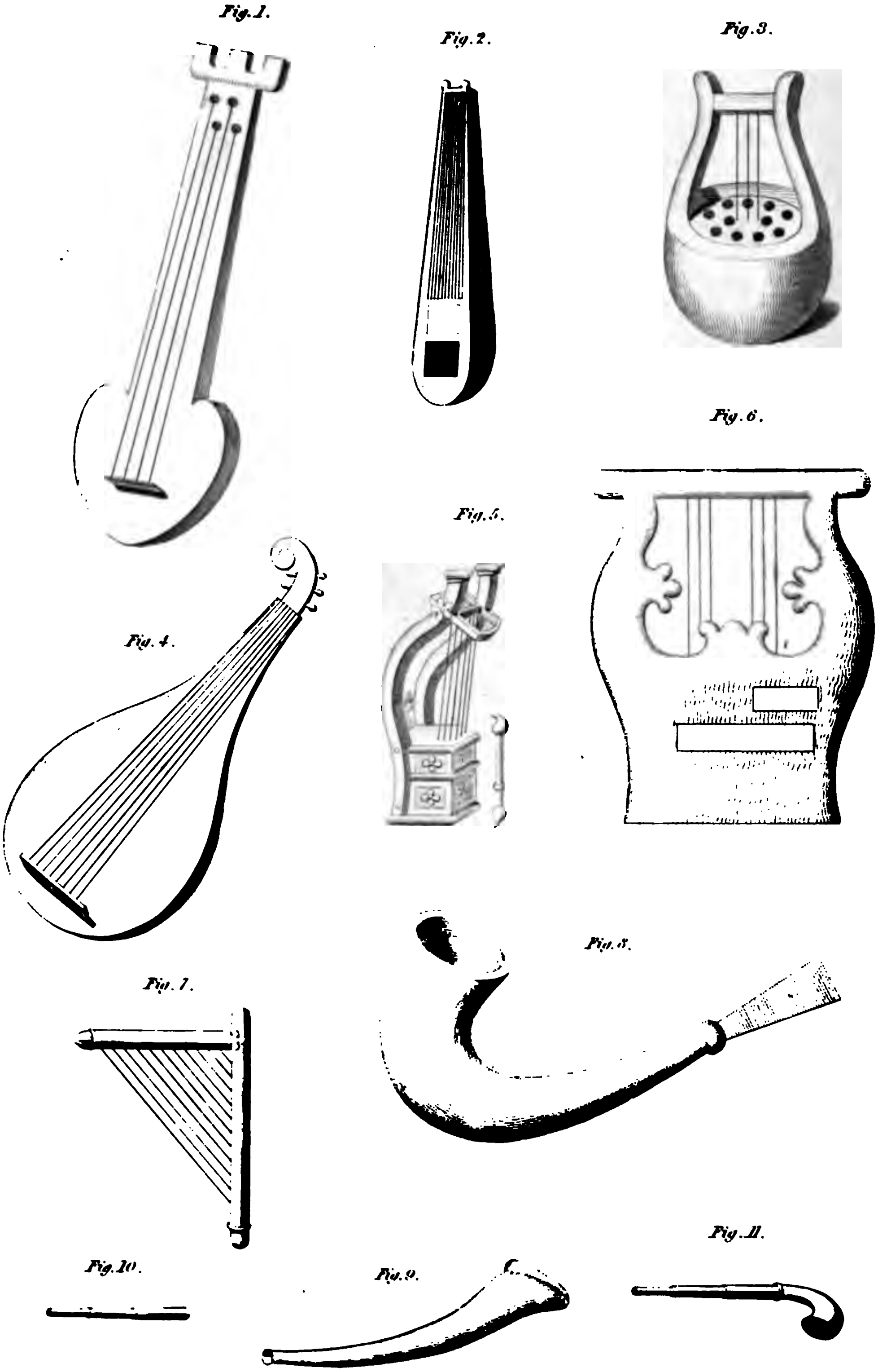
MUSIC.

PLATE VIII.



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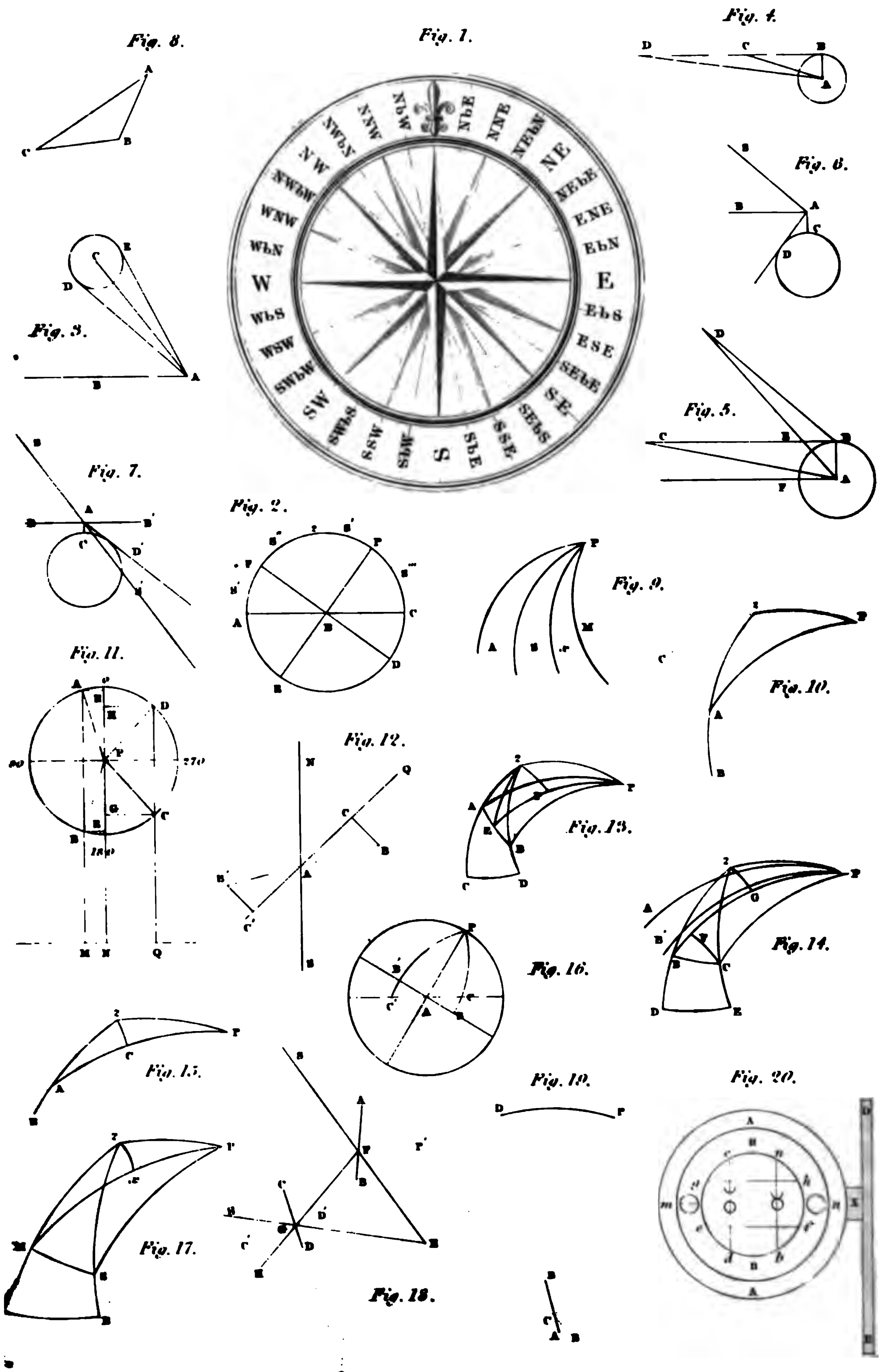
J. Storey sculp.



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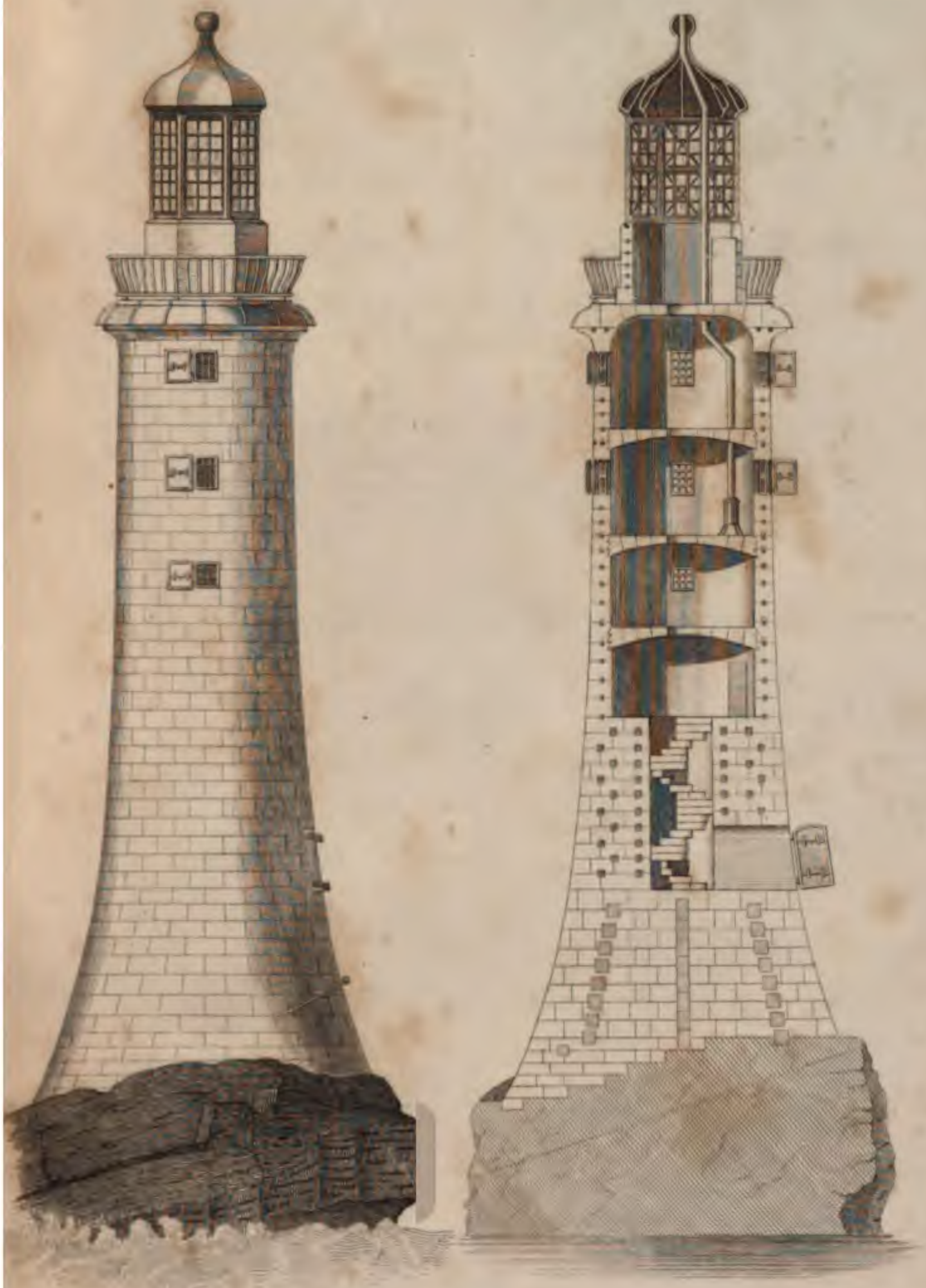
J. Shury Sc.

LIGHT-HOUSE.

Eddystone Rock Light-House.



London. Published by Thomas Tegg, 73 Cheapside September 1.1828.

J. Shury sculp.

MNEMONICS.

Fig. 1. Cabinet or Associative Key.

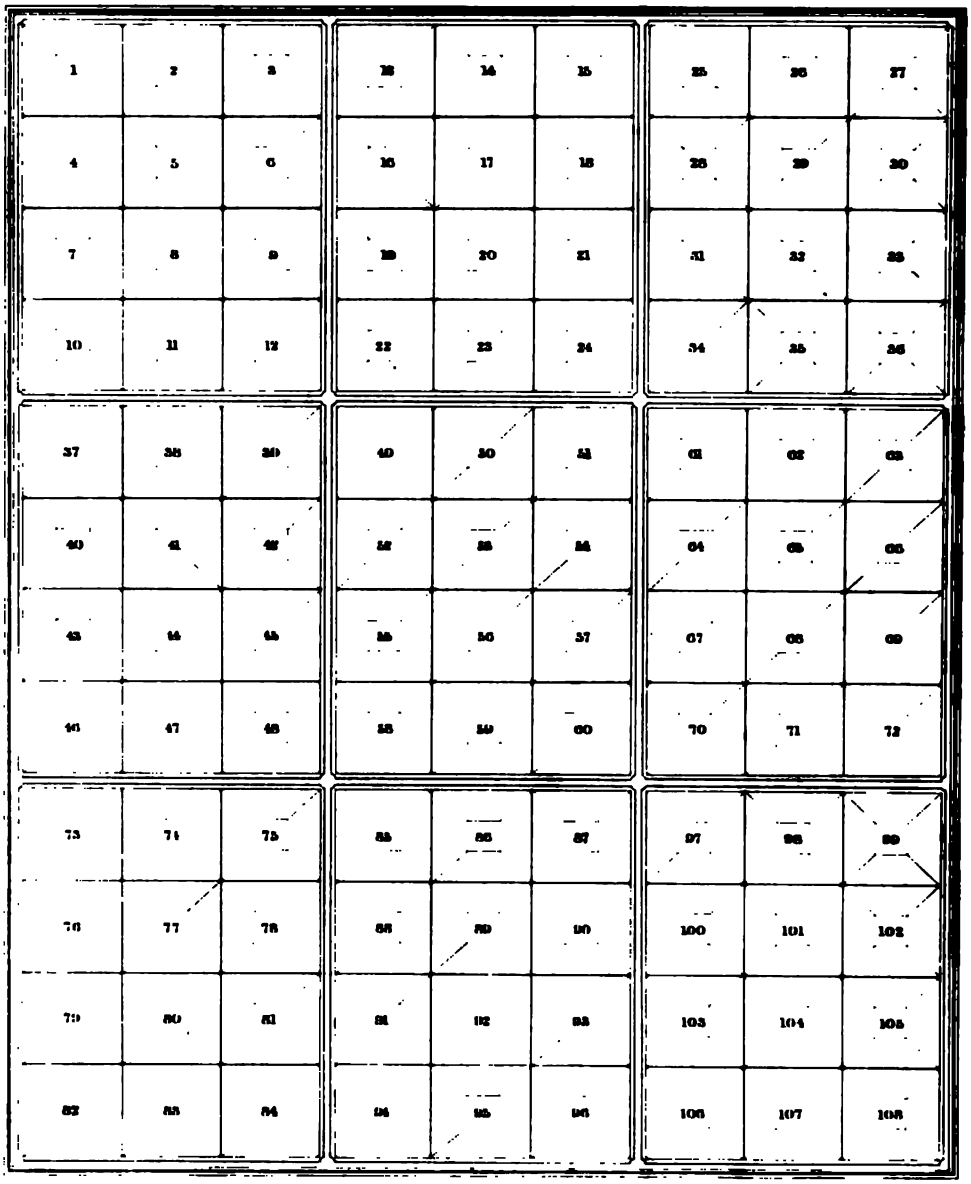
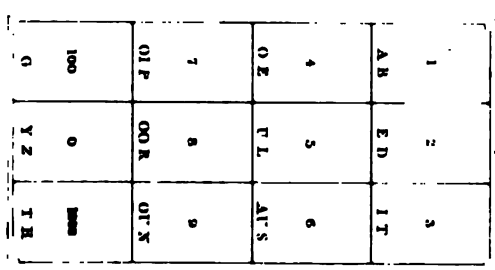


Fig. 2. Numerical Key.



J. Shury Sc.

London, Published by Thomas Tegg, 73, Cheapside, September 1, 1828.

MUSIC.

Fig. 1.

Fig. 2.

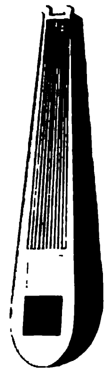


Fig. 3.

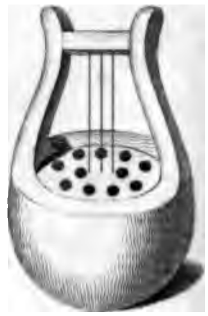


Fig. 4.

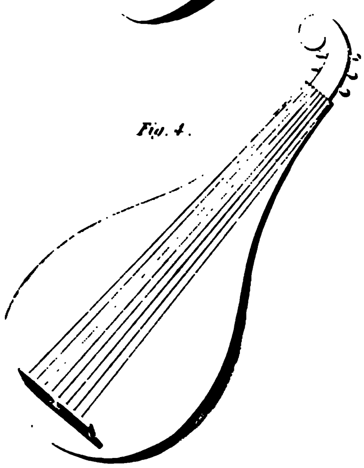


Fig. 5.

Fig. 6.

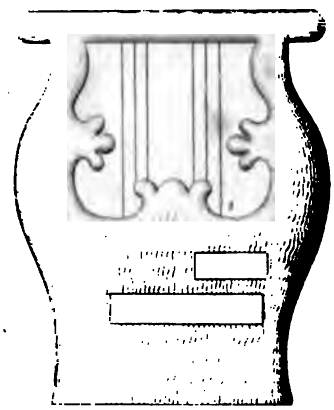


Fig. 8.

Fig. 7.

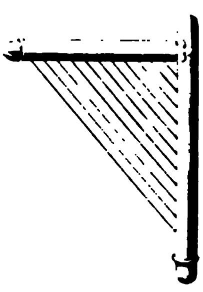
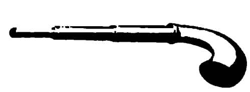


Fig. 10.

Fig. 9.

Fig. 11.



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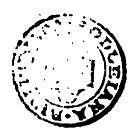

MUSIC.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

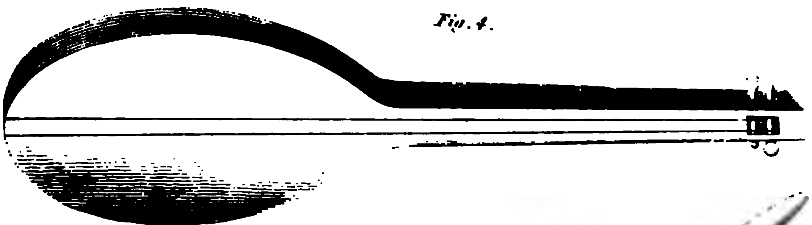

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

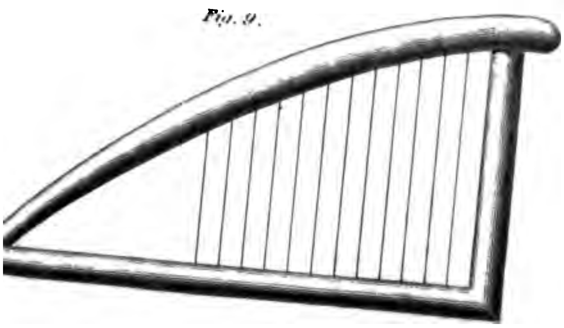

Fig. 10.

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J. Shury sculp.

ORGAN.

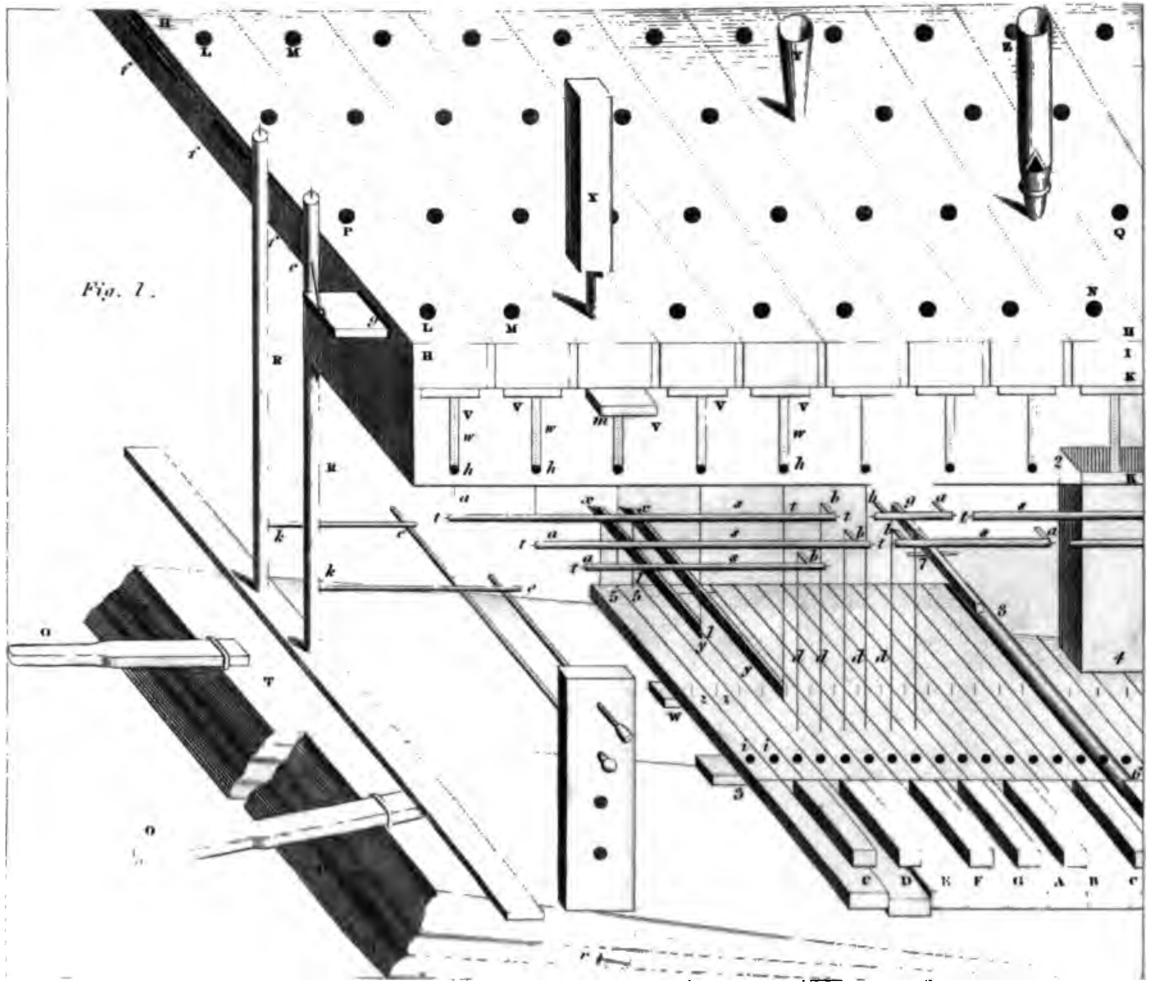


Fig. 1.

Fig. 2.

Fig. 3.

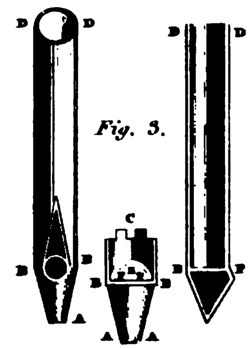
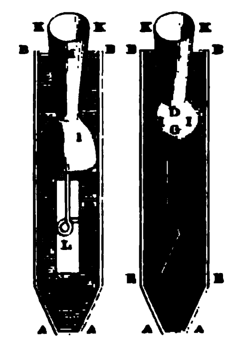
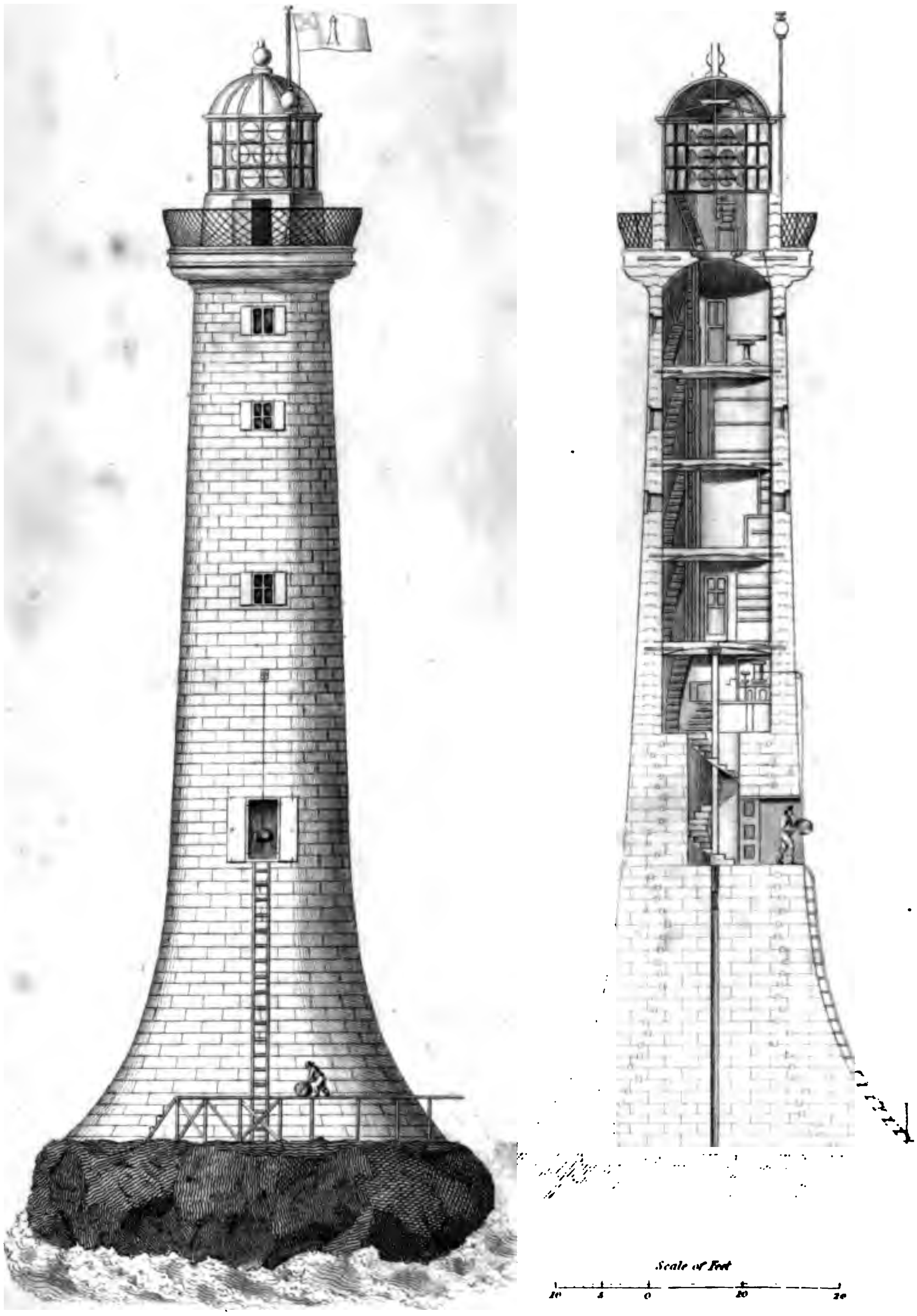


Fig. 4.



LIGHT-HOUSE.

Bell-Rock Light-House.



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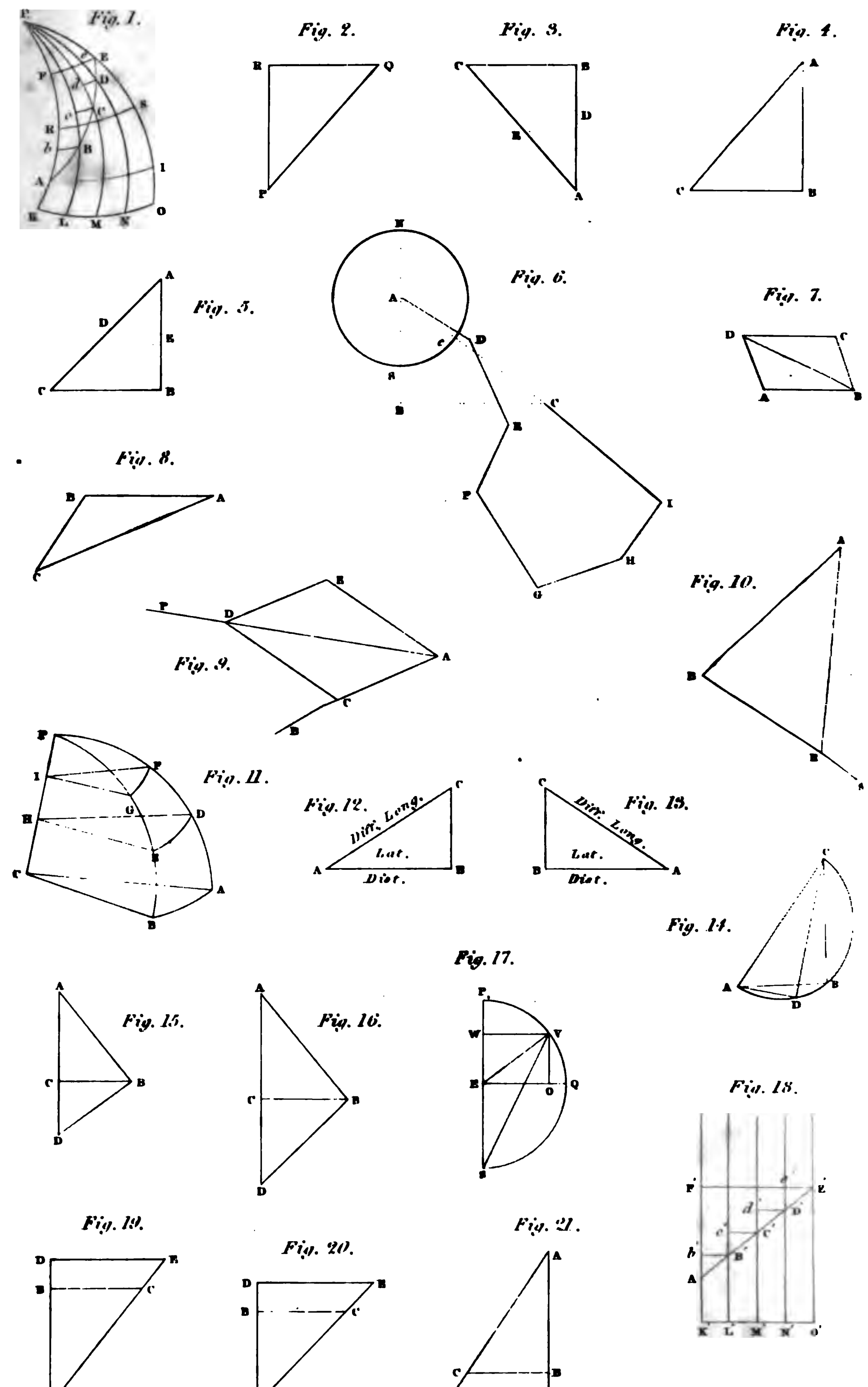
NAVIGATION.

PLATE I



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