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TAYLOR, CHARLES
SURVEYS of NATURE,

HISTORICAL, MORAL,
and

ENTERTAINING,
exhibiting the

PRINCIPLES of NATURAL SCIENCE

in various Branches

by

FRANCIS FITZGERALD Esq.
Author of the Lectures in the Artists Repository.

VOL. II.

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P R E F A C E

TO THE

SECOND VOLUME.

NATURAL History is a subject very extensive in itself, and which has been treated, by many writers in a manner so voluminous, that its information is now rather a study than an accomplishment, and much beyond the retention of the memory. In fact, on some articles it offers much that scarce deserves retention, while its accounts of others are very limited.

This division of our work is an attempt to present a general view of the subject, as little encumbered by foreign matter, or by idle tales, as possible: offering the chief specimens of each kind, and enabling the reader to acquire a knowledge of most particulars which are interesting. It was necessary in this intent to avoid the shackles of system, yet, firmly adhering to order, to group what seemed allied, and to state those apparent relations which indicate similarity, to avoid repetition and redundance, to assist the memory by conciseness, perspicuity, and relevancy.

Want of subject has been no difficulty, but to determine on a judicious selection, and to regulate their introduction,

has often been embarrassing, and occupied much reflection: We presume to think that no work of only equal bulk contains more information of general and familiar use, nor a completer or more compendious manual of natural knowledge: whether its merit be equal to the labour it has cost, or its utility be equal to the wishes of its author, must now be submitted to the determination of a candid and indulgent public; from whom, in the course of publication, we have received the most liberal testimony, and to whom we return our grateful acknowledgments, for numerous instances of approbation, and numerous marks of kindness and confidence.

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Eight Plates to this Discourse.

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E R R A T A.—VOL. II.

Page 6, part 3, line 12, *for find, read finds.*

Page 45, line 21, *for species, read kind.*

Page 1, part 4, line 15, *for quality, read faculty.*

Page 142, Running Title, *for CRUSTACEOUS FISHES, read OVIPAROUS QUADRUPEDS.*

Page 193, line 7, *for speckled, read speckled.*

Page 286, line 17, *for dangerous, read dangerous.*

SURVEYS OF NATURE.

PART THE THIRD.

IN considering the inhabitants of the globe, we must doubtless place MAN the first, in rank, and consequence, if we regard merely the animal part of his composition, wherein, nevertheless, in common with animals of all kinds, he is subject to variations, arising from local circumstances, climate, manner of life, customs, and nutriment; these variations are not so distinct, or indelible, as may induce us to disallow one common origin; yet they are sufficiently striking, to justify particular notice. We proceed therefore to offer such remarks as occur on this subject, and such general information on the nature of animals, and their manners, as may justify our principles.

It should seem, that, according to the rank of creatures in the scale of life, was their subjection to variation: those of the lower degrees changing most from their pristine stock, those of greatest fecundity changing something at each generation, while creatures of greater bulk, longer life, or superior faculties, less affected by these causes, maintained a nearer resemblance to the forms, manners, and properties of their parental origin. According to this idea we may expect plants to vary greatly from similar plants in their native climates (especially in their powers), Insects, Reptiles, smaller

Quadrupeds, and Birds; and this we find to be fact, not only in external appearance, but also in internal conformation, though the latter is noticed only by the curious—for instance, animals which with us have four stomachs, have in Africa only two; the reason we guess to be, because the African grass is more succulent, and sooner gives out its nutritive particles than ours, consequently requires less compression, and preparation, which is the office of these stomachs. In external form, very strange changes occur: fowls sent from Europe to Virginia, quickly lose their rumps, and by this loss become as it were *metamorphosed*: nor need we go so far for proofs; it is well known, our bull-dogs degenerate on the continent, and no art can maintain their race in perfection; so do our sheep. If in the same latitudes this occurs, no wonder difference of latitude should have great effect: creatures which require an ardent sun must be very much enfeebled in northern climates. This is happy for us; especially, if it be true, that we have in our own country most of those venomous insects (if not the reptiles) which beneath the Equator are so mischievous, and deadly; but with us they are so weak and diminutive, that they require the microscope to ascertain them. Our snakes are doubtless of the same nature as equatorial serpents, but of how different powers! how feeble their hiss! how diminished their terrors! Larger animals (as the horse) preserve more of their native properties, and manners, though they vary in size and strength; but no creature is capable of inhabiting the globe at large, of occupying distant and contradictory climates, like man, who

The illustration depicts a Native American man standing in a natural setting. He is shown from the waist up, facing slightly to the right. He has dark skin and is wearing a simple, light-colored garment that appears to be a tunic or a wrap around his waist. His hair is dark and short. He is holding a long, thin object, possibly a spear or a staff, which extends from his right hand down towards the ground. The background is a soft, hazy landscape with some indistinct shapes that could be trees or rocks. The overall style of the illustration is simple and somewhat ethereal, with a focus on the figure and his pose.

Native American

African.

who every where maintains his erect figure, his commanding aspect, and his dominion over all creatures around his habitation ; those he selects for service he domesticates ; those he chases fly before him ; dreading his power, and expelled (more or less) by his enmity. Even monsters of the deep, which in their profound recesses might expect security, even these yield to his arts ; and, disturbed in their retreats, seek other shores ; where to attain maturity. Thus the whale is no longer of the amazing dimensions he once was, or if he reach them, it is distant from where the prow of navigation molests his repose.

If then man be least subject to changes, yet we find in the human race considerable varieties : we may justly infer very great diversity among animals of the same tribe ; their resemblances are less marked, and their approaches to other species nearer and more frequent : we shall however chiefly advert to the differences among mankind, and leave the inference to reflection and good sense.

We have suggested as the causes of variety among the human species, climate, manner of life, customs, and nutriment ; we conclude that these are the principal causes of this variety, because if these be changed the effect changes also.

CLIMATE is not only, in general, hot or cold, moist or dry, but in some places in the same countries ; hotter or colder, moister or drier, than in others. Upon mountains, in valleys, the action of the sun differs ; consequently heat differs also. Around lakes and marshes, by the sides of great rivers, we expect superabundant humidity, more watery air is breathed
(acting

(acting internally), or affects the skin, the hair, &c. (acting externally); mineral particles also impregnate the air, and have consequent influence not only on health, but on appearance.—This cause might be traced *ad infinitum*.

MANNERS OF LIFE vary so greatly among mankind, that much must be attributed to them. Cleanliness permits free perspiration, and a clear skin; upon this Europeans value themselves; while Hottentots clothe themselves in grease, and of tawny make foot-black complexions. Those always in smoke must needs be smoke-dried; those always sedentary feeble and inactive, those always scorched by the sun shrivelled, those exposed to the seasons weather-beaten; these effects are so evident in the various classes of people which compose our own nation, that little imagination is necessary, to allow their full force among those tribes of mankind whose days are passed in constant subjection to any one of them.

CUSTOMS and MANNERS follow closely on modes of life: what was at first arbitrary becomes at length national, what has been esteemed a beauty determines the wishes of all, and by degrees their features; the power of imagination is not easily calculated. Religious rites, tyrannical imposition, local diseases, constant depression of mind, superstition (which is always gloomy) and other habitual manners, greatly influence the expression of the countenance.

FOOD, above all, is the cause of variety, by its *quantity* or its *quality*. If little and ill supplied, can it afford nutriment adequate to the consumption of the body? Can it fill the parts, and furnish throughout the whole, those juices requisite

to general increase ? If now enjoyed in abundance, is there no danger of indisposition by repletion ? If now withheld, is not weakness and debility likely to ensue ? The *quality* of food is confessedly different, as well animal as vegetable : if coarse and refuse, or in good condition ; if juicy, or dry in its nature ; if fresh, or preserved by artificial means, salt, or smoke, correspondent effects on those who live on it may naturally be expected. And to this must be added, the very great variety of liquors, fermented or simple, water, milk, beer, wine, sap of trees, spirits from corn, rice, vinous fermentations, and what answers the same end, opium. These are many of them daily noticed by us, and from what we actually see, we may readily conclude their influence elsewhere.

These causes branch out into almost innumerable effects ; and vary in the same kingdom, or country. To trace them further is rather the province of the Geographer than the Naturalist ; though it must be owned that whatever concerns our race, interests something in us superior to curiosity.

What was the *original* COLOUR of mankind, has long divided the learned. Upon the whole, I acquiesce in the opinion that the lighter Asiatics are the nearest to it ; for in our own country, which stands first in fairness of complexion, the tints of those among us exposed to the air, &c. are little different from many Asiatics. That exposure to air is our natural state, I am persuaded : and thus circumstanced, the clearest skin acquires a tint of *brunette*. The deviation of colour has been toward fairness in Europe,—towards blackness in Africa. Not but that the upper skin of a Negro is colourless as our
own ;

(acting internally), or affects the skin, the hair, &c. (acting externally); mineral particles also impregnate the air, and have consequent influence not only on health, but on appearance.—This cause might be traced *ad infinitum*.

MANNERS OF LIFE vary so greatly among mankind, that much must be attributed to them. Cleanliness permits free perspiration, and a clear skin; upon this Europeans value themselves; while Hottentots clothe themselves in grease, and of tawny make foot-black complexions. Those always in smoke must needs be smoke-dried; those always sedentary feeble and inactive, those always scorched by the sun shrivelled, those exposed to the seasons weather-beaten; these effects are so evident in the various classes of people which compose our own nation, that little imagination is necessary, to allow their full force among those tribes of mankind whose days are passed in constant subjection to any one of them.

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own ;

own: the feat of blackness is said to be the reticular membrane, between the skins; and this tint probably arises from some secretion thrown more plentifully on that part by the heat of the country, and coloured by heat, by exhalations from minerals and vegetables, and by vapours of various kinds, not omitting the dry and sultry winds of Africa.

We conclude these introductory remarks, by observing the wisdom evident in disposing each nation of men to think highly of their own country, notwithstanding the inconveniences apparent to strangers. The African enjoys his heat, the Laplander his cold, the Asiatic his indolence, the European his activity. Each find a something peculiarly agreeable in his native climate, and is condemned by his own mouth if ungrateful to the universal Benefactor: nor is it less proper that each should admire his national complexion, should depict beauty as charming black, and feel the shafts of love shot from delightful jet; or engage roses and lilies in feeble comparison with the object of admiration, and describe her complexion as *whiter* than snow. Were it otherwise, and that our native land displeased us, we should seek foreign shores, and encounter thousands of useless perils, and unprofitable difficulties: we should mingle, without benefit, the tawny with the fair, the light with the dusky, the white with the black, which though it *may* be done, and thereby proves the common nature and common origin of mankind, yet seems to promise little happiness and comfort, little pleasure and solace, little domestic satisfaction, and personal enjoyment: without which, what is climate, complexion, manners, or even life itself!

Laplander.

V A R I E T I E S
OF THE
H U M A N S P E C I E S.

THERE seem to be about six varieties in the human species, each strongly marked, and indicating little mixture.

The first around the polar regions. The Laplanders, the Esquimaux Indians, the Samoeid Tartars, the inhabitants of Nova Zembla, the Borandians, the Greenlanders, and Kamskatkadales, may be considered as one race of people, resembling each other in stature, complexion, and customs. Under a rigorous climate, of few productions, and coarse provisions and scanty, their bodies have been stunted, and their complexions changed, by cold, to a deep brown, often inclining to blackness. These people, in general, are of short stature, and odd shape, with countenances savage, and manners barbarous. Their visage is large and broad, the nose flat and short, the eyes yellowish brown inclining to black, the eye-lids drawn toward the temples, the cheek-bones extremely high, the mouth very large, the lips thick and turned outwards, the voice thin and squeaking, the head large, the hair black and straight, the colour of the skin dark greyish. The generality are about four feet high, the tallest five. The women resemble the men so nearly that one cannot, at first, distinguish the sexes.

Stupidity, superstition, and cowardice, belong equally to these people: yet they are dexterous in skating, in constructing their sledges, wherein they are drawn over the snow, in the use of the bow, and the dart, in the management of their rein-deer; and those near the coast, in fishing. They have few wants, which they easily supply, and *Linnaeus* says they have more content and enjoyment than nations which esteem them barbarous; and which in return they do not hesitate to condemn as ill-bred and unpolite.

They are all hunters, and pursue the ermine, the fox, the ounce, and the martin, for their skins. These they barter, with their southern neighbours, for brandy and tobacco; of both which they are fond to excess. Their food is principally dried fish, the flesh of rein-deer and of bears. Their bread is bones of fishes pounded, mixed with the inner bark of the pine tree. Their drink is train-oil, or brandy; when deprived of these, water, in which juniper berries have been infused.

The second great variety, in the human species, is the Tartar race; whose country comprehends great part of Asia; consequently, includes a number of nations, of various forms and complexions. But, however different from each other, they agree in being unlike any other people. These have the upper part of the visage very broad, and wrinkled even in youth; their noses short and flat, their eyes little and sunk in their heads; in some of them, five or six inches asunder; their cheek-bones high, the lower part of the visage narrow, the chin long and prominent, their teeth large and apart, their eye-brows thick, and hanging, their eye-lids thick, the face broad and flat, the complexion olive, and hair black. They are of a middle size, extremely strong and robust. They have little beard, straggling on the chin. They have large thighs, and short legs. The ugliest are the Calmoucks, whose appearance is frightful. They lead an erratic life, dwelling in tents of hair, or skins. They live upon flesh of horses or camels, raw, or sodden between the horse and the saddle; also fish dried in the sun. Their usual drink is mare's milk, fermented with millet ground into meal. They shave the head, except a lock of hair, on the top, which they form into tresses, on each side the face. The women, counterparts to the men, wear their hair, which they ornament with bits of copper and other finery.

Irreligious, immoral, indecent, dishonest, and filthy, for the most part characterizes these nations: yet among them are exceptions: but all are dexterous at plunder, traffic in slaves, can endure great hardships, and travel long without rest: are very fond of horses, and expert in their management: receive from this animal clothing and food.

To this race is referred the Chinese and the Japanese, however different they seem. The Chinese have broad faces, small eyes, flat noses, and scarce any beard; are broad and square-shouldered, and rather less in stature than Europeans. These are marks common to them and the Tartars.

Chinefe.

Hottentots.

North American.

The Japanese resemble the Chinese, and rank in the same class. They differ in being rather browner, as they inhabit a more southern climate.

A third variety in the human species, is the southern Asiatics. The nations of the Peninsular India, seem to be the stock whence the islands scattered in the Indian ocean, have been peopled. They are, in general, of a slender shape, with long straight black hair, and often Roman noses. Thus they resemble Europeans in stature and features; but greatly differ in colour, and habit of body. The Indians are of an olive colour, in the more southern parts, quite black; the women are extremely delicate. The Indians are cowardly and effeminate; the warmth of their climate influences their manners; slothful, submissive, luxurious; satisfied with sensual happiness without mental pleasure; contented with slavery, they readily obey any master. Many tribes among them eat nothing that has life; but are fearful of killing the meanest insect. To this class we may refer the Persians and Arabians.

The fourth variety in the human species, is the Negroes, which blacken the southern parts of Africa, from 18 degrees north to the Cape of Good Hope. The Caffres, indeed, who inhabit the southern extremity of that large continent, differ somewhat in colour and features, but may be grouped together. Negro nations also differ: peculiar countries, as in Europe, pride themselves on their beauty. Those of Guinea are ugly, and of ill scent; those of Mosambique are reckoned beautiful, and have no ill smell. Negroes, in general, are of a black colour, with a soft smooth skin, proceeding from the downy softness of the hair growing on it. The hair of their heads is soft, woolly, and short. The beard, also, partakes of the same qualities; but soon turns grey, which the hair rarely does; so that white beards, and black hair occur together. Their eyes are generally a deep hazle; their noses flat and short; their lips thick and tumid; their teeth of ivory whiteness. The climate seems also to relax their mental powers; they are, in general, stupid, indolent, and mischievous. The many colonies of Arabians who migrated south into Africa, have become scarce distinguishable from the original natives. As also the Portuguese, who, about two centuries ago, settled along this coast, are become almost as black as the Negroes, and equally barbarous.

A fifth race, different in colour, as distinct in habitation, is the natives of America (except in the northern extremity, where they resemble the Laplanders): these are of a red or copper colour; nearly all of one colour; have black, thick, straight hair; and thin black beards; which they

pluck out by the roots. They have, in general, flat noses, high cheek-bones, and small eyes; and these deformities they increase by art. They paint the body and face of various colours, and consider hair, except upon the head, as a deformity to be eradicated. Their limbs are generally slighter than those of Europeans. Their frequent wants make them surprisingly patient; distress by familiarity becomes less terrible; they possess rather apathy than fortitude. They have a serious air, but seldom think; are improvident; but though indolent, capable of great exertions. They live by the chase; are cruel to their enemies, but kind and just to each other.

The sixth variety of the human species, is the Europeans, and bordering nations, including the Georgians, Circassians, and Mingrelians, the inhabitants of Asia Minor, and the northern parts of Africa, with part of the countries north-west of the Caspian sea. These differ much, but generally agree in the colour of their bodies, their complexions, their largeness of limbs, and vigour of understanding. It is natural to suppose, that some intermixtures must have taken place, even among the most secluded nations; visitants, whether friends or foes; some traffic, though but little, and some removes, though seldom, must have had their effect. Hence mixtures, and hence those lesser branches, which possess not solely the likeness of any unmingled race.

Q U A D R U P E D S.

THE HORSE.

OF all quadrupeds, the horse is most beautiful; his noble form, his glossy smoothness of skin, his graceful ease of motion, and exact symmetry of shape, have induced us to regard him as the first of animals, and as the most perfectly formed; yet, his internal structure differs more from the human than that of all other quadrupeds.

The horse, like other animals, is naturally wild, and domesticated by the art of man; his enemies of the forest are but few, none but the greater kinds will venture to attack him; these he is able to overcome singly, but is content to find safety in society; wild horses herding together, often in droves of five or six hundred. As they are never attacked but at a disadvantage, when they sleep in the forests, one among their number stands as sentinel, and this office they take by turns. If a man approaches them while feeding by day, the sentinel walks boldly near him, as if to examine, or to intimidate him; as the man approaches within pistol shot, the sentinel alarms his fellows, by a loud kind of snorting, upon which all fly off with the speed of the wind; their faithful sentinel bringing up the rear. They will not admit of strange animals among them, even of their own kind. If a tame horse attempts to associate with them, they soon oblige him to seek safety by flight.

Arabia produces the most beautiful breed of native horses, the most generous, swift and persevering. They are found wild, though not in great numbers, in the deserts of that country; and the natives use every stratagem to take them. They are active and beautiful, yet not so large as those bred up tame; are of a brown colour; their mane and tail very short, and the hair black and tufted. Their swiftness is incredible; to pursue them with dogs is fruitless. By their rapid flight, they are instantly out of view, and dogs themselves give up the pursuit. They are taken by traps, hidden in the sand, which entangle their feet. If the horse thus caught be young, he is considered as a great delicacy, and affords a feast; but if he promises to be serviceable in his nobler capacity, he is tamed by the usual methods, fatigue and hunger, and soon becomes an useful domestic.

The manner of trying their speed is by hunting the ostrich: the horse is the only animal whose rapidity equals that of this creature, which inhabits the sandy plains of those countries. When the ostrich perceives itself aimed at, it makes to the mountains, while the horseman pursuing with all possible swiftness, endeavours to cut off its retreat. The chase then continues along the plain, the ostrich using both legs and wings to assist its motion; only a horse of the first speed is able to outrun it: and if, in a trial of this kind, he is not readily tired, his price becomes proportionably great; some horses are valued at a thousand ducats. Horses thus caught, or thus trained, are at present rare.

The Arabians preserve pedigrees of their horses with great care, for ages. They know their alliances and genealogies; they distinguish their races by different names, and divide them into three classes. I. The nobles, the ancient breed, unadulterated on either side. II. The horses of the ancient race, but adulterated. III. Those common and inferior. They know, by experience, the race of a horse by his appearance; and can tell the name, the surname, the colour, and the marks properly belonging to each. The most ordinary mare of the first race sells for 500 crowns; many for 1000, and some for 14 or 1500l. As the Arabians live in tents, they also serve them for stables; so that the mare, the foal, the husband, the wife, the children, lie together indiscriminately; the little children are often astride on the body, or neck of the mare, which permits their caresses without injury. The Arabians never beat their horses; but treat them gently; speak to them, and seem to discourse with them as friends; never attempt to increase their speed by the whip, or spur them but in cases of necessity. When thus urged, they set off with amazing swiftness; they leap over obstacles with as much agility as a buck; and, if the rider happens to fall, are so manageable, that they stand still in the midst of their most rapid career. The Arabian horses are of a middle size, easy in their motions, and rather inclined to leanness than fat. They eat nothing during the day; only drink once or twice; at sun-set a bag is hung to their head, containing about half a bushel of clean barley, which they eat during night. When the spring is past, they are taken from pasture, and barley is their only food during the rest of the year, except now and then a little straw. They are always kept ready saddled at the tent door from morning till sun-set, in order to be prepared against surprise.

From Arabia the most generous race of horses has been transmitted to many parts of the world, to Egypt, to Barbary among the Moors, and

and from them into most parts of Africa. Europe also, and even America, highly prize Arabian horses. America had not originally this noble animal; but now has plenty, not only domestic, but wild also. At this time, almost all nations have their respective breeds of horses, and according to their soil, climate, or management, the animal improves or degenerates.

By great assiduity, application, and management in their breeding, English horses are now superior to all others for size, strength, swiftness, and beauty. By judicious mixture of foreign original kinds, the happy difference of our soils, and our superior skill, we have brought this animal to its highest perfection. An English horse excels the Arabian, in size and swiftness; is more durable than the Barb, and more hardy than the Persian. Our racers go at the rate of a mile in two minutes: and we had one instance, in the admirable Childers, of still greater rapidity. He has been frequently known to move above eighty-two feet and a half in a second, or almost a mile in a minute: and he has run round the course of Newmarket, which is little less than four miles, in six minutes and forty seconds.

T H E A S S .

THE horse and the ass, though nearly approaching in form, are of distinct kinds, and of different natures: were there but one of each kind, both races would probably be extinguished. Their shapes and habits may resemble; but there is something in every animal, beside conformation, or way of life, that determines its specific nature.

The onager, or wild ass, abounds more than the wild horse; and the peculiarities of its kind are more distinctly marked than among the tame. Had it been a horse degenerated, or were a horse an ass improved, the wild animals of both kinds would resemble each other, much more than those domesticated, on whom art has long been employed in producing new habits and alterations. The contrary however obtains, and the wild ass is even more *asinine*, than that bred in servitude; and has a natural aversion to the horse.

This animal is found wild in many islands of the Archipelago, particularly in that of Cerigo: also in the deserts of Lybia and

Numidia: they run with such amazing swiftness, scarce even the coursers of the country can overtake them. When they see a man, they set up a horrid braying, and stop short all together, till he approaches near them; then fly off with great speed; and on such occasions generally fall into traps which are previously prepared. The natives take them chiefly on account of their flesh, which they esteem delicious eating; and for their skins, of which that kind of leather is made which is called shagreen.

The ass was originally imported into America by the Spaniards. That country seems to have been peculiarly favourable to this race of animals; and, where they have run wild, they have multiplied in such numbers, that in some places they are become a nuisance. They have the swiftness of horses; neither declivities nor precipices retard their career. When attacked, they defend themselves with their heels and mouth with such activity, that, without slackening their pace, they often maim their pursuers. But the most remarkable property in these creatures is, that after carrying their first load, their celerity leaves them, their dangerous ferocity is lost, and they soon contract the stupid look and dulness peculiar to their species. It is also observable, that these creatures will not permit a horse to live among them. They always feed together; and if a horse happens to stray where they graze, without giving him the liberty of flying, they bite and kick him till they leave him dead on the spot.

But the ass, in a state of tameness, is the most gentle and quiet of animals. He suffers, without resistance, the ill treatment of his owners: he is temperate with regard to the quantity and quality of his provision; and makes his humble repast on what the horse and other animals leave behind: he prefers the plantane among herbs; is delicate with respect to his water; drinks only at the clearest brooks, and chiefly those to which he has been accustomed. He drinks as soberly as he eats; and never, like the horse, dips his nose into the stream: he never rolls, like the horse, in the mud; he even fears to wet his feet; and turns out of his way to avoid dirt.

When over-loaded, the ass hangs down his head, and lowers his ears; when too hard pressed, opens his mouth, and draws back his lips in a very disagreeable manner. If his eyes are covered he will not stir a step; if he is laid down in such a manner that one eye is covered with the grass while the other is hidden with a stone, or whatever is next at hand, he continues in the same situation, and will not

attempt

attempt to rise to free himself from those slight impediments. He walks, trots, and gallops like a horse ; but though he sets out very freely at first, yet is soon tired ; and no beating will make him mend his pace.

We have good reasons to believe that, were the same care bestowed on the ass as on the horse, and the same industry used in crossing the breed and improving it, we should see the ass become from his present mean state, a very portly and serviceable animal ; we should find him rival the horse in some of his perfections, and exceed him in others. The ass, bulk for bulk, is stronger than the horse ; is more sure-footed ; and, though slower in his motions, is much less apt to start out of the way.

Though now common in England, the ass was lost among us during the reign of Queen Elizabeth. Holingshed informs us that our land did yield no asses : but we have accounts of their being frequent in England before that time. In Sweden and the north, they are a sort of rarity. The hotter climates are the original of this serviceable creature. In Guinea, they are larger and more beautiful than their horses. In Persia, they have two kinds ; one used for burthens, being slow and heavy ; the other for the saddle, being smooth, stately, and nimble. They are managed as horses, and they are taught to amble like them ; but the rider sits nearer the crupper. They generally cleave their nostrils to give them more room for breathing, and many of these are sold for forty or fifty pounds.

Of all animals covered with hair, the ass is the least subject to vermin, for he has no lice, probably owing to the dryness and hardness of his skin : he is three or four years in coming to perfection ; lives till twenty or twenty-five ; sleeps much less than the horse ; never lies down for that purpose, unless very much tired. The she-ass goes above eleven months with young ; never brings more than one at a time.

The MULE may be engendered either between a horse and a she-ass, or between a jack-ass and a mare. The latter breed is larger, stronger, and better shaped. The common mule is healthy, and will live above thirty years, being very serviceable in carrying burthens, particularly in mountainous and stony places, where horses are not so sure-footed. The mule is not totally and necessarily barren : beside the authority of Aristotle long ago, modern observation furnishes facts in proof of this assertion ; but as the instances are very rare, the mule may be con-

dered as an animal generally barren, consequently, contrary to the order of nature, who has confined fertility within certain bounds, that intermixture of species might not prevail, nor instead of regular descendants, broods of mishapen forms and manners.

THE ZEBRA

IS chiefly a native of the southern parts of Africa ; whole herds of them feed in those extensive plains that lie towards the Cape of Good Hope. By their watchfulness they suffer nothing to come near them ; and by their swiftness, they leave every pursuer far behind. The zebra, in shape, resembles the mule rather than the horse, or the ass ; is rather less than the former, yet larger than the latter ; its ears not so long as the ass, nor so small as the horse. Like the ass, its head is large, its back straight, its legs finely placed, and its tail tufted at the end ; like the horse, its skin is smooth and close, its hind quarters round and fleshy. But the amazing regularity and elegance of its colours is its greatest beauty. In the male, they are white and brown ; in the female, white and black, disposed in alternate stripes over the whole body, like so many ribbands, narrow, parallel, and exactly separated from each other ; every stripe is perfectly distinct, and preserves its colour round the body (or the limb) without diminution. The head, body, thighs, legs, tail, and ears, are thus beautifully streaked.

The head of the male zebra is striped with bands of black and white, which center in the forehead. The ears variegated with white and dusky brown. The neck has broad stripes of the same dark brown running round it, leaving narrow white stripes between. The body is striped across the back with broad bands, leaving narrower spaces of white between them, ending in points at the sides of the belly, which is white, except a black line pectinated on each side, from between the fore-legs, along the middle of the belly, two thirds of its length. There is a line of separation between the trunk of the body and the hinder quarters, on each side ; behind which, on the rump, is a plat of narrow stripes, joined together, by a stripe down the middle, to the end of the tail. The colours differ in the female ; the stripes vary sometimes, but are always equally distinct ; the hair equally smooth
and

and fine; the white shining and unmixed; and the black, or brown, thick, and lustrous.

Such is the beauty of this creature, by nature seemingly fitted for the pleasure and service of man. Hitherto, however, it has disdained servitude, and neither force nor kindness has subdued its native independence and ferocity. Yet probably this animal, by time and assiduity, might be brought under subjection. As it resembles the horse in form, without doubt it has a similitude of nature, and only requires the efforts of an industrious and skilful nation, to be added to the number of our domestics. Nor is its extraordinary beauty the only motive for wishing this animal among our dependents: its swiftness is said to surpass that of all others; so that the speed of a zebra is become a proverb among the Spaniards and Portuguese. It stands better upon its legs also than a horse; and is consequently stronger in proportion.

The zebra is chiefly a native of the Cape of Good Hope. It is also found in the kingdom of Angola; and, as we are assured by Lopez, in several provinces also of Barbary.

This animal, which is peculiar to Africa, is easily fed. That which came over into England some years ago, would eat almost any thing, bread, meat, tobacco, or hay. As it so nearly resembles the horse and the ass in structure, it probably brings forth annually as they do. Their noise is neither like that of a horse nor an ass, but more resembling the confused barking of a mastiff dog. In some the skin hangs loose upon the neck, in a kind of dewlap, which takes away much from their general beauty.

RUMINATING ANIMALS.

ANIMALS that chew the cud are most harmless, and most easily tamed. As they live on vegetables, they seldom desire to change their pastures, while furnished with a proper supply of food ; and fearing nothing from each other, they generally go in herds for mutual security. The fiercest of the carnivorous kinds seek their prey in solitude ; these, on the contrary, range together, and unite in mutual defence ; the hare itself is gregarious, in countries where it has no enemies but the beasts of the forest.

Ruminant animals seem naturally more indolent and less artful than the carnivorous ; their appetites more simple, and their instincts more confined. As it requires a tedious process to transmute grass into flesh, Nature has, generally, furnished grass-eaters with four stomachs, through which the food successively passes, to undergo the proper separations.

I. The paunch, which receives the food after a slight chewing.
 II. The honeycomb, properly a continuation of the former. These two, which are very capacious, the animal fills as fast as it can, then lies down to ruminate, which is a kind of vomiting without effort or pain. The food, by chewing a second time, is rendered more soft and moist, and at last liquid enough to pass into the third stomach, where it undergoes still farther comminution. In this stomach, called the manyfold, from the number of its leaves (all which promote digestion), the grass appears like boiled spinach : in the fourth stomach, it is completely macerated, and ready to be turned into chyle.

The stomach of ruminant animals is strong and muscular, the more readily to act on its contents ; their intestines fat, the better to preserve their warmth ; and extended to a great length, so as to extract the whole nourishment which their vegetable food supplies.

The cow, the sheep, and the deer being furnished with four stomachs, may properly be called the ruminant kinds ; though many others have

have this quality in a small degree. Among animals, the rhinoceros, camel, horse, rabbit, marmotte, and squirrel. Among birds, the pelican, stork, heron, pigeon, and turtle, have a power of disgorging their food (chiefly to feed their young). Among fishes, lobsters, crabs, and one or two others. Among insects, the mole, cricket, wasp, drone, bee, grasshopper, and beetle. All these animals either actually or *seemingly* chew the cud. Their stomachs are composed of muscular fibres, by means whereof their food is ground up and down, in the same manner as in those distinguished by the appellation of ruminants.

OF THE

COW KIND.

OF all ruminant animals, those of the cow kind deserve the first rank, for their size, their beauty, and their services.

The climate and pasture of Great Britain are excellently adapted to this animal's moderate nature; our verdant and fertile plains perfectly suit its manner of feeding; for wanting the upper fore teeth, it loves to graze in a high rich pasture, little regarding the quality of its food, if supplied in abundance. In no part of Europe the tame animal grows larger, yields more milk, or more readily fattens, than with us.

Our pastures supply them with plenty; they in return enrich the pasture; for of all animals, the cow seems to give back more than it takes from the soil.

This animal is furnished with eight cutting teeth in the lower jaw; at the age of ten months, the two middlemost fall out, and are replaced by others not so white, but broader; at sixteen months, the two next milk-white teeth fall out, and others appear: thus changing every six months, till all the cutting teeth are renewed, which then are long, pretty white and equal; but as the animal advances in years, they become irregular and black, their inequalities smoother, and the animal less capable of chewing its food. The cow often declines from this cause; for, being obliged to eat a great deal to support life, the smoothness of its teeth renders chewing difficult, and the quantity chewed inadequate to supply the stomach.

At three years old, the cow sheds its horns, and new ones arise, which are permanent ; at four years of age, the cow has small pointed neat smooth horns, thickest near the head ; at five they become larger, and are marked round with the former year's growth ; and every year produces a new ring at the root ; so that allowing three years before their appearance, and adding the number of rings, we have the animal's age. Some cows have horns, others have none ; this seems a kind of caprice of nature, for which we can assign no reason.

Of all quadrupeds, the cow seems most liable to alteration from its pasture. In our own country, we perceive great varieties, produced by the variation of soil. In some they grow very large ; in others, they are very diminutive. The breed of the Isle of Man, and most parts of Scotland, is much less than that of England or Ireland.

The cow kind is found in most parts of the world, large or small in proportion to the richness of the pasture. Africa is remarkable for the largest and the smallest cattle of this kind ; as is India, also, Poland, Switzerland, and several other parts of Europe. Among the Eluth Tartars, where the pastures are remarkably rich, the cow becomes so large, that he must be a tall man who can reach the tip of its shoulder. Almost every where the cow is found in some of its varieties ; large, like the urus, or humped as the bison ; with straight horns, or bending, inverted backwards, or turning sideways to the cheek, like those of the ram ; and, in many countries, without horns, as in Iceland. The cattle of the Ukraine, where the pasture is excellent, become very fat, and are considered as one of the largest breeds of Europe. In Switzerland, among the mountains, are large ; in France small ; very small in Barbary. The famous bulls of Spain are by no means comparable to our own ; nor is a Spanish bull fight worthy the applause bestowed on it by their writers, requiring no great bravery, and little more address, than to take advantage of the bull's mistaking the cloak for the cavalier, and of his strutting his eyes (as this animal is said to do) before he strikes with his horns.

But the differences in size of this animal are not so remarkable as those of its form, its hair, and its horns. These are so very extraordinary, that they have been considered as constituting different creatures, and names have distinguished what in reality is the same. The urus and the bison have been regarded, from the variety in their make,

as

as distinct in their production ; but they have a certain mark of one common stock ; they breed among each other, and consequently form one kind, notwithstanding the extreme bulk of the urus, or the hump on the back of the bison : their breed is fruitful, and among their descendants, the hump belonging to the bison is soon worn away.

The URUS, or wild bull, inhabits chiefly the province of Lithuania ; and grows to a size scarce equalled, except by the elephant ; is quite black, except a stripe mixed with white, that runs from the neck to the tail, along the top of the back ; the horns are short, thick and strong ; the eyes fierce and fiery ; on the forehead is a kind of garland of black curled hair, and some have beards of the same ; the neck is short and strong, and the skin has an odour of musk. The female, though less than the male, exceeds the largest of our bulls ; nevertheless, her udder and teats are so small, that they can scarcely be perceived. Upon the whole, however, this animal resembles the tame one. *Gesner*, in his *Icon. Anim.* 34, says he saw a horn, he supposed, of an urus, hung in the Strasburg cathedral, which was six feet long.

The BISON differs in having a lump between its shoulders. These animals are some very large, others diminutively little. This creature, in front, has somewhat the look of a lion, a long shaggy mane, a beard under his chin ; his head little, his eyes red and fiery, with a furious look ; his forehead large, and horns so big, and so far asunder, that three men might often sit between them. On the middle of the back grows a bunch almost as high as that of a camel, covered with hair, and which is considered as a great delicacy by the hunters. There is no pursuing him with safety, except in forests where are trees large enough to hide the men. He is generally taken by pitfalls ; the hunters dig holes in the ground, and covering them with boughs of trees and grass, provoke the bison to pursue them : they get on the opposite side of the pitfall, while the furious animal, running head foremost, falls into the pit, and is quickly overcome.

The breed of the urus, or those without a hump, chiefly occupies the cold and temperate zones ; the breed of the bison, or those with a hump, the southern parts of the world ; throughout India, and throughout Africa, from Mount Atlas to the Cape of Good Hope. In these countries, the bison seems to prevail ; where they have smooth, soft hair, are very nimble of foot, and in some measure supply the want of horses. The bison breed is expert and docile ; many of them

bend their knees to take up, or set down burthens; and are treated by their masters with much tenderness and care, which in India has degenerated into superstition. These animals are, among the Hottentots, chiefly esteemed. The bull is at once their protector and servant, attends the flocks, guards them, herds in the straying sheep, and shews no mercy to robbers, or even strangers, who attempt to plunder. These backeys (as they are called) are taught to combat even the enemies of the kraal. Every Hottentot army is furnished with a herd of them, which is let loose against the enemy. The backey lives in the same hut with its master, and, by habit, gains an affection for him. When a backey dies, a successor is chosen by a council of the old men of the kraal; he is then joined with a veteran of his own kind, from whom he learns his art, becomes social and diligent, and is taken for life into human friendship and protection.

The humps of the bisons are of different sizes, some weighing from forty to fifty pounds, others less; it is not to be considered as a part indispensable to the animal; it resembles a gristly fat; and is said to cut and taste somewhat like udder.

The American bison is rather less than that of the ancient continent; its hair is longer and thicker, its beard more remarkable, and its hide more lustrous and soft. They breed with the tame kinds, brought from Europe; and thus produce a race peculiar to that country.

The cow kind seems an ancient inmate in every climate, domestic and tame in civilized countries, savage and wild in wild countries, but capable of being useful in all: able naturally to defend itself against every enemy of the forest; and only subordinate to man: taken from the dam in a savage state, either in Africa or Asia, soon becomes humble, patient and familiar; and man may be considered, in those countries, as almost helpless without their assistance.

THE BUFFALO.

IF we compare the buffalo with our common cow, no two animals can be more alike, either in form or nature; equally submissive to the yoke, often living under the same roof, employed in the same domestic services; the make and turn of their bodies greatly alike, yet no two animals can be more distinct. Such is the fixed aversion
between

between these creatures, that the cow refuses to breed with the buffalo, while it is known to propagate with the bison, to which it has, in point of form, but very distant similitude.

The buffalo is by no means so beautiful as the cow; his figure is more clumsy and awkward; his air wilder; and he carries his head lower and nearer the ground; his limbs are less fleshy, his tail more naked of hair; his body shorter and thicker; his legs higher; his head smaller; his horns sometimes ten feet long, not so round, but black and compressed, with a bunch of curled hair hanging down between them; his skin is also harder, thicker, blacker, less furnished with hair; his flesh is hard, blackish, disagreeable to the taste and smell. The milk of the female much inferior to that of the cow, but abundant. In the warm countries, cheese and butter are made of buffalo milk. The leather made of its hide is well known for its thickness, softness, and impenetrability. Being, in general, very much larger and stronger than the cow, the buffalo is employed in agriculture; used also in drawing burthens; sometimes in carrying them; being guided by a ring thrust through the nose. Two buffaloes yoked in a waggon are said to draw more than four strong horses; as their heads and necks are naturally bent downward, they are better fitted for the draught, and the whole weight of their bodies is applied to the carriage.

Wild buffaloes are very dangerous animals, often gore travellers, and trample them with their feet, until they have mangled the whole body: in woods not equally to be feared as in plains, because in pursuit, their large horns become entangled in the branches, which gives time to escape. There is scarce any other method of avoiding their pursuit; they run with great swiftness; overturn a tree of moderate growth; and are such swimmers, as to cross the largest rivers without difficulty. Like all large animals of the torrid zone, they are very fond of the water; and, during their pursuit, often plunge in to cool themselves.

In Italy, they make the food and riches of the poor. The female produces but one at a time, in the same manner as the cow; but the cow, as we know, goes nine months; whereas the buffalo continues pregnant twelve. They are afraid of fire; and, perhaps, in consequence, have an aversion to red colours, that resemble the colour of flame: it is said, that in those countries where they are found in plenty, no person dares to dress in scarlet.

These

These are regarded as the only real varieties of the cow kind ; others have been supposed by naturalists to so many as eight or ten species ; but after proper allowances for climate, pasture, &c. there seems no need to consider others, as permanently or essentially different. Some are said to grunt like a hog, others to smell of musk. In Surat, a small kind, not bigger than a dog, draw the children in carts.

OF THE

SHEEP AND GOAT.

THE goat and the sheep differ, in the form of their bodies, their covering, and their horns ; and may be considered as two kinds, with regard to domestic purposes ; but their internal conformation is alike ; their feet, their four stomachs, their suet, their appetites, are the same ; and they propagate with each other. The produce of the buck goat with the ewe in two or three generations returns to the sheep. The sheep and the goat, therefore, belong to one family ; and were their races reduced to one of each, they would replenish the earth with their kinds.

Their internal structure is not very remote from that of the cow kind, which they resemble in their hoofs, and in chewing the cud. But the differences between these animals are sufficiently apparent by their form and size ; they are also distinguished from deer, by never shedding their horns, which draws a line between the kinds ; so that we may regard the sheep and goat as ruminant animals of a smaller size, having permanent horns.

These harmless and useful animals have been long reclaimed from the forest, and brought into a state of domesticity. The sheep is the more serviceable creature in most places ; but the goat has more sensibility and attachment. In the earliest ages, the goat seemed rather the greater favourite ; and continues such, in some countries, among the poor. But the sheep has long become the principal object of human care ; especially in our country and climate.

The sheep, in its present domestic state, is of all animals the most defenceless and inoffensive ; and, if exposed in its present state to struggle with its natural enemies of the forest, would soon be extirpated.

Loaded

Wallachian Sheep.

Loaded with a heavy fleece, incapable of defence by its horns, heavy, slow, and feeble, it can have no safety but from man. Those without horns are most dull and heavy; those whose fleeces are longest and finest, are most subject to disorders; whatever changes have been wrought in this animal being by human industry, are intirely calculated for human advantage. A succession of ages could scarce restore the sheep to its primitive state, so as to become a match for its foes of the forest.

The goat is much its superior; has its particular attachments, fees danger, and generally contrives to escape it; but the sheep is timid without cause, and secure in real danger.

It does not appear, from early writers, that the sheep was bred in Britain; nor till several ages after this animal was cultivated, that the woollen manufacture was carried on among us. That valuable branch of business lay for a considerable time in foreign hands; and we were obliged to import the cloth, manufactured from our own materials.

No country, however, produces such sheep as England; with larger fleeces, or better adapted for the loom. Those of Spain, indeed, are finer, and we generally require some of their wool to work up with our own; but the weight of a Spanish fleece is much inferior to one of Lincoln or Warwickshire: where it is no uncommon thing to give fifty guineas for a ram.

Sheep, like other ruminant animals, want the upper fore teeth; have eight in the lower jaw: two of these drop, and are replaced at two years old; four of them are replaced at three years old; and all at four. The new teeth are distinguished by their freshness and whiteness. Some breeds in England never change their teeth; these the shepherds call leather-mouthed cattle; and they are generally supposed to grow old a year or two before the rest. Sheep bring one or two at a time; sometimes three or four. They bear five months; and, by being housed, bring forth at any time of the year.

If we look for this animal in its noblest state, we must seek it in the African desert, or the extensive plains of Siberia. Its descendants have suffered so many changes, as entirely to disguise the kind, and often to mislead the observer. Scarce any two countries has sheep alike, in size, covering, shape, or horns.

The woolly sheep is found only in Europe, and some of the temperate provinces of Asia. When transported into hotter countries, it assumes a covering fitted to the climate, hairy and rough; loses its

fertility, and its flesh no longer has the same flavour. In very cold countries, it seems equally a stranger; requires unceasing attention to preserve it; and though subsisting as well in Greenland as in Guinea, yet it seems a natural inhabitant of neither.

The Iceland sheep resembles ours in form; but differs in the number of horns, having four, sometimes eight, growing from different parts of the forehead. These are large and formidable; and the animal seems fitted for a state of war: yet, is equally mild, gentle, and timid. Its wool is long, smooth, and hairy. Its colour a dark brown; and under its outward coat, it has a covering, rather resembling fur than wool, being fine, short, and soft.

A second variety is the broad-tailed sheep, of Tartary, Arabia, Persia, Barbary, Syria, and Egypt. This broad and heavy tail often weighs from twenty to thirty pounds: sometimes grows a foot broad, and must be supported by a small kind of board, that goes upon wheels. This tail is not woolly underneath like the upper part, but bare; and the natives, who consider it as a great delicacy, are very careful in preserving it from injury. Their fleeces, in the temperate climates, are soft and woolly; in the warmer latitudes hairy; yet in both these sheep preserve the enormous size of their tails.

A third variety is the sheep called *strepicheros*, native of the islands of the Archipelago, which differs from our sheep, in having strait horns, surrounded with a spiral furrow.

Another variety is the Guinea sheep, generally found in the tropical climates. They are large, with a rough, hairy skin, short horns, ears hanging down, with a kind of dewlap under the chin. They differ greatly in form from others; but breed with them. These, of all the domestic kinds, seem to approach nearest the state of nature: are larger, stronger, and swifter than others; consequently better fitted for forest life. However, they seem to rely, like the rest, on man for support; being entirely of a domestic nature, and subsisting only in warm climates.

These varieties are capable of producing among each other; their peculiarities of form result from climate and cultivation. While man thus cultivates the domestic kinds, he drives away the savage race, which is less beneficial, and more headstrong. This is found in small numbers in uncultivated countries, where they have subsisted by swiftness or strength. In Greece, Sardinia, Corsica, and particularly in the deserts of Tartary, the moufflon is found, that is thought by

M. Buffon

M. Buffon to have been the primitive race ; and that has been known to breed with the domestic animal.

The moufflon, (or musimon,) though covered with hair, bears strongest similitude to the ram : like the ram, has the eyes placed near the horns : its ears are shorter than those of the goat : resembles the ram in the contours of its form. The horns also are alike ; are yellow ; have three sides, as in the ram, and bend backwards in the same manner behind the ears. The muzzle, and inside of the ears, are whitish, tinged with yellow ; the other parts of the face, brownish grey. The general colour of the body is brown, approaching that of the red deer. The inside of the thighs and belly are white, tinged with yellow. The musimon is found in a savage state, and maintains itself, by force or swiftness, against all animals that live by rapine. From its extreme speed, many have inclined to rank it among deer : but the musimon never sheds its horns. These sometimes grow to a surprising size ; many of them measuring, in their convolutions, two ells. From yellow, the horns become the darker as the animal grows older ; sometimes are found broken off in such a manner, that the small animals of the forest creep into the cavity for shelter. The female resembles the male, but is less, and her horns never grow to such prodigious size as those of the ram.

N. B. The musimon is reckoned a goat by those who divide the kinds, but if, as asserted, breeds with the sheep, evidently belongs to both kinds.

The GOAT seems better fitted for a life of liberty than the sheep : is naturally more lively, and of keener instinct : easily attaches itself to man, and seems sensible of his caresses : is strong and swift, courageous, playful, lively, capricious, and vagrant : not easily confined to its flock ; but chooses its pasture, and loves to stray from others : delights in climbing precipices ; in going to the very edge of danger ; on rocks hanging over the sea, and on a very narrow base, often sleeps in security. Nature has fitted it for traversing declivities ; the hoof being hollow underneath, with sharp edges. This hardy animal is easily sustained, and chooses the heathy mountain, or the shrubby rock ; prefers the tops of boughs, or the tender bark of young trees ; sleeps exposed to the sun ; and seems to enjoy its heat : fears not storm, or rain ; but immoderate cold is said to afflict it with a vertigo. The inconstancy of its nature is perceivable in their regularity of its gait ; it goes forward, stops, runs, approaches, flies, merely from caprice, and extreme vivacity of disposition.

The goat produces two at a time; three at most. But in warm climates, though the animal degenerates, and grows less, it becomes more fruitful, bringing three, four, or five. The goat, like the sheep, continues five months with young; and, in some places, bears twice a year.

The goat's milk is sweet, nourishing, and medicinal; not so apt to curdle on the stomach as that of the cow; and, therefore, preferable for those of weak digestion. The milk differs in flavour from that of the cow or the sheep; the shrubby pastures, and heathy mountains, imparting an agreeable wildness to its taste. In Ireland and Scotland, on mountains almost naked, the goat gleans a living; and supplies the hardy natives with comforts. Beds are made of its skins; its milk is food; furnishes also butter and cheese; and the flesh (especially of the kid) is a delicacy, ranked by some as not inferior to venison.

We find this animal in most parts of the world. In the north, where the pasture is coarse and scanty, the goat finds a subsistence; between the tropics, the goat is adapted to the heat of the climate, and its flesh improves.

A remarkable variety of the goat is that of Natolia or Angora in Syria, which has ears longer and broader than ours. The horns of the male are black, issue horizontally on each side the head, and are twisted like a cork-screw. The horns of the female are shorter, and encircle the ear somewhat like those of a ram. Their colour is a dazzling white; their hair very long, thick, fine, and glossy; but degenerates at the distance of a day's journey from this peculiar neighbourhood. It is sold into all parts of Europe; and is the basis of the beautiful stuffs known among us by the name of camlet.

The Syrian goat is a second variety, somewhat larger than ours, with ears hanging down almost to the ground; broad in proportion; sometimes so troublesome, that the owners cut off one to enable the animal to feed. The horns not above two inches and an half long, black, and bending a little backwards; the hair of a fox colour; under the throat are two excrescences, like the gills of a cock: chiefly kept round Aleppo for their milk.

A third variety is the little goat of America, the size of a kid, but the hair as long as that of the ordinary breed. The horns, which do not exceed a finger's length, are thick, and bend downwards so close to the head, that they almost enter the skin.

The

The blue goat of the Cape of Good Hope, may be ranked as a fourth variety : is in shape like the domestic, but nearly the size of a stag. Its hair very short, of a delightful blue ; which it loses greatly when dead : has a very long beard ; horns not so long in proportion as in others ; turned spirally : has very long legs, but well proportioned ; the flesh is well tasted, but lean ; therefore chiefly killed for its skin : abounds in the uncultivated parts ; where are found others, beautifully spotted with red, white, and brown.

The Juida (or Whida) goat resembles ours, except in size, being much smaller : is common in Guinea, Angola, and along the coast of Africa : is not much larger than a hare, but extremely fat, and its flesh admirably tasted : is in that country universally preferred to mutton.

The foregoing are certainly known to belong to the goat kind ; there are others nearly resembling the goat, whose kindred is not equally evident : for being found in a state of nature, they have not been sufficiently subjected to observation. These are the CHAMOIS and the IBEX ; both approach the goat in figure, and have horns that never shed ; but, at the same time, differ more from each other than from the animal in question.

They are both natives of the Alps, the Pyrenees, and the mountains of Greece ; there they continue to exist in vast numbers, in spite of hunters and beasts of prey that incessantly pursue them.

The IBEX resembles the goat in shape ; but the horns are much larger ; are bent backward, full of knots ; and it is generally asserted that a knot is added every year. Some of these are found two yards long. The male ibex has a large black beard, is of a brown colour, with a thick warm coat of hair ; a streak of black runs along the top of the back ; the belly and back of the thighs are of a fawn colour.

The CHAMOIS, though wild, is docile, and easily tamed ; is about the size of a domestic goat, which it much resembles ; is agreeable, lively, and active beyond expression. The chamois' hair is short ; in spring is ash coloured ; in autumn dun, inclining to black ; in winter, blackish brown : abounds in the mountains of Dauphiny, of Piedmont, Savoy, Switzerland, and Germany : is peaceful, gentle, and lives in society, in flocks of from four to fourscore, or an hundred, dispersed on the crags of the mountains. The large males feed detached, except when they approach the females, and drive away the young ; which is during October and November : bring forth in March and April. The young keep with the dam five months, or longer, if not separated :

separated ; they live between twenty and thirty years. Their flesh is good. The chamois has scarce any cry ; at most a kind of feeble bleat, by which the parent calls its young. But to warn the rest of the flock, uses a hissing noise, which is heard at a great distance. This creature is extremely vigilant, and has a quick ear, and scent, and a most piercing eye. When it sees its enemy, it stops for a moment ; and instantly flies off. Its smell discovers a man at half a league distance if to windward. When alarmed, the chamois begins his hissing note with such force, that the rocks and the forests re-echo to the sound. The first hiss continues as long as the time of one inspiration. In the beginning it is very sharp ; deeper towards the close. Having reposed a moment, he again looks round, and continues to hiss by intervals, till the alarm has spread to a very great distance. During this time, it seems in the most violent agitation ; strikes the ground with its fore-foot, and sometimes with both ; bounds from rock to rock ; turns and looks round ; runs to the edge of the precipice ; and flies with all its speed. The hissing of the male is much loudest and sharpest ; it is performed through the nose ; and is properly a very strong breath, driven violently through a small aperture. The chamois feeds on the best herbage, and chooses the most delicate parts of plants, and of aromatic herbs, which grow on the sides of the mountains : drinks little while feeding on succulent herbage ; chews the cud in the intervals of feeding. This animal is greatly admired for the beauty of its eyes, which are round and sparkling : has two small horns, of a beautiful black, rising from the forehead almost between the eyes, and jetting out forward ; at their extremities they bend a little backward, in a small circle, and end in a very sharp point. The ears are placed near the horns : on each side of the face are two stripes of black ; the rest being a whitish yellow. These animals are incommoded by heat, and never found in summer, except in caverns of rocks, amid unmelted ice, under the shade of spreading trees, or of rough and hanging precipices, which keep off the rays of the sun. They feed early in the morning, and late in the evening. During winter, lodge in the hollows of rocks to avoid the *avalanches*, or snow-rolls, and dig through the snow for food. They run along the rocks with ease, and leap from one to another, so that no dogs can pursue them. They mount or descend in an oblique direction ; throw themselves down a rock of thirty feet, and alight securely on some excrescence, or fragment, on the side of the precipice, which is just large enough to receive their feet : in their descent, they
strike

strike the rock with their feet, three or four times, to stop the velocity of their motion ; and, when arrived on their base below, are at once fixed and secure. When jumping in this manner, they seem rather to have wings than legs. Their hinder legs are rather longer than their fore-legs, and bend so that, when they descend upon them, they break the force of the fall. Hunting the chamois is very laborious, and difficult. The usual way is to hide behind the clefts of rocks and shoot them. Dogs are quite useless in this chase, as they rather alarm than overtake. Nor is it without danger to men ; for often when the animal finds itself over-pressed, it drives at the hunter with its head, and tumbles him down the neighbouring precipice, unless he has time to lie down, and let the chamois pass over him. This animal cannot go upon ice when smooth ; but if there be the least inequalities on its surface, it bounds along, and evades pursuit.

Such are the quadrupeds that belong to the goat kind. It is hard to discover where the sheep ends and the goat begins ; still harder to determine the boundaries between the goat and the deer. But in transitions from one kind to another, is generally a middle race, that partakes of each, and can precisely be referred to neither. Such are the gazelles, properly neither goat nor deer, yet possessing many marks of both.

THE GAZELLES,

OR

ANTELOPES,

LIKE the goat, have hollow permanent horns, a gall bladder, and feed rather upon shrubs than pasture. But they resemble the roe-buck in size and form ; in having deep pits under the eyes ; in the colour and nature of their hair ; in the bunches upon their legs, which differ in being on the fore-legs in these, on the hind-legs in the other.

They differ from both goat and deer by their horns, which are annulated (or ringed) with longitudinated depressions running from the bottom to the point ; by having bunches of hair on their fore-legs ; and by a streak of black, red, or brown, running along

the lower part of their sides; and three streaks of whitish hair in the internal side of the ear. Of all animals in the world, the gazelle has the most beautiful eye, extremely brilliant, yet so meek that eastern poets compare the eyes of their mistresses to those of this animal, as the highest compliment. The gazelle is most delicately and finely limbed; its hair short, fine, and glossy. Its hinder legs are longer than those before; is extremely swift; runs along in an even, uninterrupted course. Most are brown on the back, white under the belly, with a black stripe, separating those colours between. The tail of various lengths, but in all covered with pretty long hair; and the ears beautiful, well placed, and terminating in a point; hoofs cloven.

Of these animals, M. Buffon makes twelve varieties; which is much fewer than other naturalists have made them. *First*, the GAZELLA, properly so called, the size of a roe-buck, and much resembling it; but differing in the horns, which are black, hollow, (like those of the ram, or goat) and never fall. The *second*, the KEVEL, rather less than the former; its eyes larger; its horns flatted on the sides. The *third*, the CORIN, still less; its horns smaller, smoother, and their annular prominences scarce discernible. Some of these animals are often seen streaked like the tiger. The *fourth*, the ZEIRAN, which he supposes to be a larger kind of gazelle, found in India and Persia. The *fifth*, the KOKA; the *sixth*, the KOB: these differ only in size, the former being much the largest. The *seventh* he calls after its Egyptian name, the ALGAZEL; the horns very long, being generally three feet. The *eighth*, the PAZAN; called by some, the bezoar goat. As the algazel feeds on the plains, this is only found in the mountains, of Egypt, Arabia, and Persia. This is the animal famous for that concretion in the intestines or stomach, called the Oriental Bezoar, which was once in such repute all over the world for its medicinal virtues. The *ninth* is the NANGUER, a native of Senegal; differs somewhat in shape and colour; but particularly in its horns, which are strait to near the points, where they crook *forward*, pretty much as in the chamois they crook backward. The *tenth* is the ANTELOPE, so well known to the English, who have given it the name; is the size of a roe-buck; resembles the gazelle, but differs in having deeper eye-pits; the horns differ also, being about sixteen inches long, almost touching at the bottom, spreading as they rise, so as at their tips to be sixteen inches asunder. They have annular prominences, but not so distinguishable

distinguishable as in the gazelle. A very remarkable double flexure distinguishes them: at the root, a tuft of very long hair. The antelope is brown on the back, and white under the belly; but these colours are not separated by the black streak which belongs to the gazelle kinds. The *eleventh* variety M. Buffon calls the LIDME, which has very long horns. The *twelfth* and last, he calls the Indian ANTELOPE, whose horns are very small.

To these may be added three or four varieties, which equally resemble both the goat and the gazelle. First, the BUBALUS, that seems allied to the cow, the goat, and the deer: like the stag in size and figure, particularly its legs; but has permanent horns, like the goat; and resembling those of the gazelles; while the make of its head is exactly like the cow in the length of its muzzle, and in the disposition of the bones of its skull. Has a narrow, long head; eyes placed very high; forehead short and narrow; horns about a foot long, black, thick, annulated; shoulders very high, a kind of bunch on them, terminating at the neck; tail about a foot long, and tufted. The hair of this animal remarkable, being thicker at the middle than at the root; the only instance, except the elk. Common in Barbary. Seems with most propriety reckoned among the antelopes.

The second anomalous animal, M. Buffon calls the CONDOMA; supposed equal in size to the largest stag, with hollow horns, and varied flexures above three feet long; at their extremities, two feet asunder. Along the back runs a white list, another of the same colour crosses this, at the bottom of the neck, which it surrounds: two more run round the body, one behind the fore-legs, the other parallel to it before the hinder. The general colour of the body greyish; the belly white: has a long grey beard; legs long, but well proportioned; native of Africa.

A third is the GURB: resembles the gazelles, except the colour of the belly, which is white in them, but in this of a deep brown. Its horns also are smooth and polished; is remarkable for white lists, on a brown ground, disposed along the animal's body, as if it were covered with harness: is native of Africa.

The African wild goat is a fourth: of a dark ash colour: in the middle of the head a hairy tuft, standing upright; on both sides, between the eyes and the nose, are very deep cavities, which contain a yellow oily liquor, (coagulating into a black substance, with a smell between musk and civet): if taken away, again runs out.

To these we may add the CHEVROTIN, or little Guinea deer, the least of all cloven-footed quadrupeds; its legs, at the smallest part, little thicker than the shank of a tobacco-pipe; is about seven inches high, twelve from the point of the nose to the insertion of the tail; is completely formed like a stag in miniature; except that its horns, when it has any (as in Guinea only), are of the gazelle kind, hollow and annulated; has two canine teeth in the upper jaw; in which it differs from the goat or deer, and makes a singular species. The hair, which is short and glossy, is in some a beautiful yellow, except the neck and belly, which is white. Native of India, Java, Ceylon, Guinea, and the tropics. They may be easily tamed, and become familiar and pleasing; but are of such delicate constitutions, they can bear no climate but the hottest.

Such are the gazelles, or antelope kinds: of warm climates, extremely swift, shy, sure-footed, though among rocks or precipices, impracticable but to themselves: birds only can follow, and overtake them: for this purpose the falcon is trained throughout the east; and their chase forms a principal amusement and employment of those countries.

THE

DEER KIND.

THE stag seems made to embellish the forest, and animate its solitudes. His easy elegance of form, and lightness of motion; his large branches, rather the ornament than defence of his head; his size, strength and swiftness, rank him among the noblest quadrupeds.

The first year, a stag has no horns, but a horny excrescence, short, rough, and covered with a thin hairy skin. The second year, his horns are single and straight; the third year, they have two antlers; the fourth, three; the fifth, four; the sixth, five (this number is not certain). After the sixth year, the antlers do not always increase.

These horns are shed yearly. They are firm and solid, and employed in making knife-handles, &c. While young, they are soft and tender. The animal, on shedding his horns, hides himself in thickets, never venturing out to pasture, except by night. This usually happens

pens in spring; the new horns are very painful, and of quick sensibility. When the old horn is fallen, the bones of the skull are bare, being covered only with a transparent periosteum, which covers all bones. After a short time, this skin begins to swell, and forms a soft tumour, containing a great deal of blood, and is gradually covered with a downy substance that feels like velvet. This tumour buds from the point like the graft of a tree; and, rising by degrees, shoots out the antlers on either side, so that speedily, in proportion to the animal's condition, the head is completed: but at first is very soft, and has a sort of bark, which is a continuation or integument of the skull. It is velvety and downy; every where furnished with blood-vessels, that nourish the growing horns. As these creep along the branches, they imprint the whole surface. The horns begin to harden at bottom while the upper part remains soft, and continues growing. Hence it appears they grow differently from those of sheep or cows; in which they increase from the bottom. When the whole head has received its full growth, the extremities begin to acquire solidity; the velvet covering, or bark, with its blood-vessels, dry up, and begin to fall; this the animal hastens and completes, by rubbing its antlers against every tree.

If a stag be castrated when its horns are fallen, they will never return; if when they are on, they will never fall. If partially, he will want the horn on that side. Plenty or scarcity of provision, fatigue and disease, greatly affect the growth of the horns. It seldom happens that the branches on both sides fall off together, there being two or three days interval. The old stags usually shed their horns first, the latter end of February, or in March; those of the second head (between five and six years old) about the latter end of March; those younger, in April; the youngest of all, in May: they generally shed them in pools of water, and this has given rise to the opinion of their hiding them.

The horns generally increase in thickness and in height from the second year to the eighth, but feel the impressions of age, and shrink like the rest of the body. The horns also partake of the nature of the soil; in fertile pastures they are large and tender; in barren soils they are hard, stunted, and brittle, correspondent to the state of the creature himself.

When stags have shed their horns, they are utterly unable to defend themselves. They walk with their heads stooping, to keep them from striking against the trees above. Thus they continue near three months before their heads acquire their full growth and solidity. About the end

of

of August, they return to the mountain to seek the hind, to whom they call with a loud tremulous note. At this time their neck is swollen; they appear bold and furious; fly from country to country: and butt with their horns. At the end of this period of madness, the creature that was before fat, sleek, and glossy, becomes lean, feeble, and timid. As he is above five years coming to perfection, he lives about forty years.

The usual colour of the stag in England was red; nevertheless, the greater number in other countries are brown. Some few are white; but these perhaps obtained this colour in a former state of domesticity. Of all animals in this climate, none have so beautiful an eye as the stag: it is sparkling, soft, and sensible. His smelling and hearing are in perfection. When alarmed, he lifts his head and erects his ears. Man is not the enemy he most fears; he seems delighted with the shepherd's pipe; and the hunters sometimes use that instrument to allure him.

The stag eats slowly, and is delicate in his choice of pasture. He retires to covert to chew the cud in security. His rumination seems performed with difficulty; not without much straining, and a kind of hiccup, which is easily perceived the whole time. Some years ago, William Duke of Cumberland caused a tiger and a stag to be inclosed in the same area; the stag made so bold a defence, that the tyger was at last obliged to fly.

The cry of the hind, or female, is not so loud as that of the male, and never excited but by apprehension for herself or her young. She has no horns. The time of gestation is between eight and nine months; generally produce but one about May, or June: they take great care to hide their young, since almost every creature is then a formidable enemy. What is more unnatural, the stag himself is a professed enemy, and she is obliged to use all her arts to conceal her young from him as from the most dangerous of her pursuers. At this season, the courage and arts of the male seem transferred to the female. The calf (as the young stag is called) accompanies the dam the whole summer; in winter, the hind, and young males assemble in herds, which are numerous in proportion as the season is severe.

The stags of China are no taller than a common house-dog; hunting them is a principal diversion of the great. Their flesh, while young, is good; at maturity, hard and tough: the tongue, the muzzle, and the ears, are in particular esteem among that luxurious people. Their manner of taking them is singular: they carry a head of the female stuffed, and exactly imitate her cry; upon this the male appears, and
perceiving

perceiving the head (which is all that the hunter, who is himself concealed, discovers) advances, the company then rise, surround, and often take him alive.

There are very few varieties in the red deer of this country. But in different parts of the world, they differ in form, size, horns, and colour.

The Corsican stag is a very small animal, not above half the size of ours. His body is short and thick, his legs short, and his hair a dark brown.

In the forests of Germany is a kind of stag, named by the ancients the *Tragelaphus*, which the natives call the *Bran*, or *Brown Deer*; is of a darker colour than the common stag, of a lighter shade upon the belly, and long hair upon the neck and throat, by which it appears bearded, like the goat. The *Hippelaphus* is of the same race.

The *Axis* (of Pliny), between the stag and the fallow deer, is a beautiful stag inhabiting the banks of the Ganges, Ceylon and Java; are very tame, and, though they readily eat bread, will refuse a piece that has been breathed on.

Although there are but few varieties of the deer kind, yet the deer seems generally diffused over the earth. America produces stags, and deer. The Mexicans have a breed of white stags in their parks, which they call *Stags Royal*. The Americans are said to have brought the stag to the same domestic tameness as our sheep, goats, or cattle. They send them forth in the day-time to feed in the forests; and at night they return home with the herdsman who guards them.

THE FALLOW DEER.

THE stag and the fallow deer are alike in form, in disposition, in the furniture of their heads, in swiftness and timidity; yet they never herd together, or form a mixed breed; and where the stag is common, the buck seems a stranger. The fallow deer are less robust, and savage than the stag; are, in general, bred in parks, and kept for their venison. The horns of the buck are broad and palmated; whereas those of the stag are in every part round; they are shed yearly and take the usual time for repairing. The fallow deer is easily tamed, and feeds upon many things which the stag refuses. By this means it preserves its venison better. The doe goes with young above eight months, common-

ly brings one : the buck comes to perfection at three, and lives till sixteen years. The strength, cunning and courage of this animal, is inferior to the stag ; being lighter, and not tracking so deeply, it leaves a less powerful and lasting scent, and the dogs in pursuit are more frequently at a fault.

We have in England two varieties of the fallow deer, which are said to be of foreign origin. The beautiful spotted kind, supposed to have been brought from Bengal ; and the very deep brown sort, introduced by King James the First, from Norway. From having observed their hardiness, and that they could endure the winter, even in that severe climate, without fodder, he brought over some of them into Scotland, and disposed of them among his chaces. Since that time, they have multiplied in many parts of the British empire ; and England is now become more famous for its venison, than any other country. Found in most parts of Europe, in Greece, Syria, and the north of China.

THE ROE-BUCK

IS the smallest of the deer kind in our climate, and is almost extinct, except in some of the highlands of Scotland. Exceeds three feet long, and two feet high ; horns from eight to nine inches long, upright, round, divided into only three branches, and are deciduous. Body covered with very long hair, well adapted to the rigour of its mountainous abode. The lower part of each hair is ash-colour ; near the ends is a narrow bar of black, and the points are yellow. The hairs on the face are black, tipped with ash-colour. The ears are long, their insides a pale yellow, and covered with long hair. The spaces bordering on the eyes and mouth, are black. The chest, belly, legs, and inside of the thighs, are yellowish white ; the rump pure white ; the tail very short. This animal is very elegant and swift.

The roe-buck courts the shady thicket, and the rising slope. Its hair is always smooth, clean, and glossy ; it frequents only the driest places, and the purest air. Though but a little animal, yet, when its young is attacked, it faces even the stag himself, and often comes off victorious. It is cunning, difficult to pursue, and, though its scent is much stronger than that of the stag, more frequently makes good a retreat. The stag never uses art till his strength declines ; but when the

the roe finds its first efforts to escape without success, it returns on its former track, again goes forward, and again returns, till by its various windings, the scent is entirely confounded, and the last emanations joined to those of its former courses. It then, by a bound, goes to one side, lies flat on its belly, and permits the pack to pass by without offering to stir.

These animals live in families; the sire, the dam, and the young ones; and never admit a stranger. All the deer kind are inconstant but the roe-buck, who never leaves its mate; as they have been generally bred up together from fawns, their attachment is strong, permanent, and mutual. The female fawns in May; goes with young five months and an half; which distinguishes this animal from all others of the deer kind, that continue pregnant more than eight.

The female retreats to the thickest woods, being not less apprehensive of the buck than of the wolf, the wild cat, and other ravenous animals; generally produces two, very rarely three. In about ten or twelve days these are able to follow their dam, except pursued. On such occasions, the tenderness of the dam is extraordinary; leaving them in the deepest thickets, she offers herself to the danger, and flies before the hounds, to mislead them from the retreat of her little ones. Such animals as are not beyond her power, she boldly encounters; attacks the stag, the wild cat, and the wolf; enemies, which, in conjunction with mankind, have diminished the species.

The fawns follow the deer eight or nine months. They shed their horns the latter end of autumn, and renew them during winter. When they fall, and new ones appear, the roe-buck does not forsake its usual haunts, but keeps down its head to avoid striking its horns against the branches of trees, the pain of which it seems to feel with exquisite sensibility. It seldom is found to live above twelve or fifteen years; if kept tame, not above six or seven. They may be subdued, but never domesticated, or be made familiar: inhabits most parts of Europe, in Tartary and China, not Africa. Uncertain whether an American animal of this kind is of this species, or one resembling it, that is very numerous, as well in Louisiana as in Brasil.

T H E E L K.

THE Elk is rather of the buck, than the stag kind, as its horns are flattened toward the top; but far exceeds in stature, being often ten feet high: is called in Europe the Elk, and in North America the Moose-deer. It is timorous and gentle; content with its pasture, and never willing to disturb any other animal, when supplied itself.

The hair is very long and coarse: the ears a foot and an half long. The upper jaw longer by six inches, than the lower; and almost divided by a deep hollow: has a sort of beard under the throat, hanging from a small excrescence, and a prominence in the middle of the forehead. The nostrils four inches long on each side the mouth; nose very broad; it uses its fore feet, which are very sharply hoofed, to strike down its enemies; hind-legs much shorter than the fore-legs; hoofs very much cloven; colour of the body in general a hoary black, and grey about the face.

There are two kinds, the common grey moose, which is not very large, and the black moose; all have flat palmated horns, the palm very large, having a short trunk at the head, and immediately spreading above a foot broad, with a kind of small antlers, like teeth, on one of the edges.

The grey moose-deer is about the size of a horse; as in all of this kind the upper lip is much longer than the under, it is said they go backward as they feed. Their nostrils are so large that a man may thrust his hand in a considerable way.

Josselyn, the first English writer who mentions the black moose, says, it is a goodly creature, twelve feet high, with exceeding fair horns, that have broad palms, two fathoms from the top of one horn to another: that it is a creature, or rather a monster of superfluity, and many times bigger than an English ox. This Dudley confirms, but gives to the horns only thirty-one inches between tip and tip: however, that such an extraordinary animal as Josselyn describes, has actually existed, we cannot doubt, since horns twelve feet from tip to tip have often been found in a fossil state, as well in Ireland as in America.

These animals delight in cold countries, feeding on grass in summer, and bark of trees in winter. The natives prepare to hunt them when the sun begins to melt the snow by day, which is frozen again at night; for then the icy crust which covers the snow, usually four feet deep, is too weak to support so great a bulk, and retards the creature's motion. The
timorous

timorous animal, by its endeavours to escape, sinks at every step it takes. Still it pursues its way through a thousand obstacles: the snow yields to its weight; the sharp ice wounds its feet; and its lofty horns are entangled in the branches as it passes: these are broken down with ease; and where the moose-deer runs, is traced by the snapping off branches of trees, as thick as a man's thigh, with its horns. The chase lasts thus a whole day; sometimes two, or three days. The moose trots on (for that is its usual pace), till its pursuers come up; after repeated wounds, and repeated exertions, quite tired, and spent, it sinks, like a ruined building, and shakes the earth beneath its fall.

The flesh is well tasted, and said to be very nourishing. The hide is strong, and so thick, that it has been often known to turn a musket ball. The fur, when viewed through a microscope, appears spongy like a bulrush, and is smaller at the roots and points than in the middle; for this reason, it lies very flat and smooth, and though beaten and abused never so much, always returns to its former state.

THE REIN-DEER

IS a native of the polar regions, and incapable of sustaining more temperate climates. From it the natives of Lapland and Greenland supply most of their wants; like a horse, it conveys them and their scanty furniture from mountain to mountain; like a cow it gives milk; and like the sheep, it furnishes a warm, though homely clothing: the milk affords cheese, the flesh, food; the tendons, bowstrings; and when split, thread; the horns, glue; the bones, spoons.

The rein-deer somewhat resembles the elk in its horns, has brow-antlers, very large, and hanging over the eyes, palmated toward the top, and bending forward. The rein-deer is much smaller, lower, and stronger built than the stag; its legs shorter and thicker, its hoofs much broader, its hair much thicker and warmer, its horns much larger, as also its ears; its pace is rather a trot than a bounding, and this it can continue for a whole day; its hoofs are cloven and moveable, so that it spreads them abroad as it goes, to prevent sinking in the snow, which, when it raises its feet again, occasions them to strike together with an audible crack: the elk has the same peculiarity. The female rein-

deer has horns as well as the male, by which the species is distinguished from every animal of the deer kind.

When the rein-deer first shed their coat they are brown; but, as summer approaches, their hair grows whitish; and at last, nearly grey. They are, however, always black about the eyes. The neck has long hair, hanging down, and coarser than other parts. The feet, at the insertion of the hoof, are surrounded with a ring of white. The hair in general stands so thick over the body, that if one should attempt to separate it, the skin will no where appear uncovered: when it falls, it seems broken short near the bottom; so that the lower part of the hair remains.

The horns of the female are like those of the male, but they are smaller and less branching. As in other deer, they sprout from the points; and also are furnished with an hairy bark, which supports the blood-vessels, of most exquisite sensibility. The rein-deer shed their horns, at the latter end of November; and are not completely furnished again till towards autumn. The female retains hers till she brings forth.

In Lapland this animal is of the greatest advantage, where it forms the riches of the inhabitants, some of whom possess herds of a thousand: their great enemies are the innumerable swarms of gnats which infest the lower grounds in summer, and even drive them from their pastures to the mountains, where the gnats fear to come because of the cold.

Besides the gnat, there is a gadfly, no less formidable and often fatal. This fly is bred under their skins, where the egg has been deposited the preceding summer; and is no sooner produced than it endeavours to deposit its eggs in a place similar to that from whence it came. Whenever, therefore, this fly appears over an herd of rein-deer, it terrifies the whole body; they know their enemy; and by tossing their horns, and running among each other, endeavour to avoid it, or run for shelter to the mountains; they have also enemies in the beasts of the forest, and have diseases some of which are sudden, contagious, and incurable.

The female brings forth in the middle of May, and gives milk till about the middle of October. Every morning and evening, during summer, the herdsman returns to the cottage with his deer to be milked, where the women have previously kindled a smoky fire, which drives off the gnats, and keeps the rein-deer quiet. The female yields about a pint, then the herdsman drives them back to feed; neither folds nor houses them, neither provides their subsistence, nor cultivates their pasture,

Their

Their chief, and almost their only food, in winter, is the moss, which, from its being fed on by this animal, obtains the name of the rein-deer lichen (*lichen rangiferinus*). This is of two kinds; one white, which covers almost all the desert parts of the country like snow; the other black, which covers the branches of the trees. The deer pursue their food, though covered in the deepest snow, even though its surface be frozen: They turn it up with their noses, like swine, for the hide by use is hardened in that part.

The rein-deer of this country are of two kinds, wild and tame. The wild are larger and stronger, but more mischievous than the others. No creature can be more active, patient, and willing than the tame; when hard pushed, they will trot nine or ten Swedish miles, or between fifty and sixty English miles, at one stretch: but the poor obedient creature fatigues itself to death. In general, they can go about thirty miles without halting, and without danger.

They go with young about eight months and generally bring two. The dam is fond of her young, and often, when they are separated from her, returns from pasture, keeps calling round the cottage for them, and will not desist, till they are brought and laid at her feet. They are at first of a light brown, but become darker with age. The old ones almost approach to blackness. The young follow the dam two or three years; do not acquire their full growth till four; are then broke in, and managed for drawing the sledge, and continue serviceable four or five years longer. Live about fifteen or sixteen years.

O F T H E

M U S K A N I M A L.

MUSK is brought to Europe in small bags, about the size of a pigeon's egg, containing a kind of dusky reddish substance, like coagulated blood, which, in large quantities, has a very strong smell; but when mixed and diffused, becomes a very agreeable perfume. No substance known has a stronger or more permanent smell. A grain of musk perfumes a whole room; and its odour continues some days without diminution. In a larger quantity it continues for years, and seems scarce wasted in weight, though it has filled the atmosphere to a great distance.

distance with its particles. In nervous and hysteric disorders, it is found a powerful remedy. The animal that furnishes this admirable medicine, is known but imperfectly.

The Musk animal has no horns; wants fore teeth in the upper jaw, the same as ruminating animals; but has two tusks hanging out exposed. Eight small cutting teeth in the lower jaw. It is three feet six inches in length, about two feet three or four inches high. The head is above half a foot long; the fore part of the head is somewhat like a greyhound; ears long and narrow, inside pale yellow, outside deep brown, partly erect, like those of a rabbit; the tail not two inches; is cloven-footed; hoofs slender and black; hair is erect, on the head and legs half an inch long, on the belly an inch and half, on the back and buttocks three inches, and proportionably thicker than in any other animal; is waved brown and white alternately, from the root to the point; on the head and thighs brown, under the belly and tail white, a little curled, especially on the back and belly. On each side of the lower jaw, under the corners of the mouth, is a tuft of thick hair, which is short and hard, about three quarters of an inch long. The hair of this animal is soft and fine; but what distinguishes it are the tusks, which are near two inches long, and turn back in the form of a hook; and, more particularly, the musk bag, which is about the size of a hen's egg, on the belly of the male only: It has two small orifices, one naked, the other hairy. It is a very fearful animal; has the sense of hearing so quick, that it can discover an enemy at a great distance.

The female is less than the male, nose sharper, wants the two tusks, and has two small teats. Inhabits the kingdom of *Tibet*, *China*, *Tonquin*, and *Bontan*, from lat. 60 to 45 or 44; but never wanders so far south, except forced by severity of the season, when they seek corn or rice newly grown. Inhabits naturally mountains covered with pines; loves solitude; if pursued, seeks inaccessible summits. It is extremely probable, that the musk-bags sold by the hunters are adulterated, as the greatest plenty of the animal could scarce supply the quantity sold. The flesh of the animal is infected with the scent, but is eaten by the Muscovites. The Tibet musk is the best; the Russian the worst. This is not the only animal resembling the deer, yet without horns. There are others in Brazil and India.

THE

CAMEL AND THE DROMEDARY.

THESE animals are in all respects the same, except that the camel has but one bunch on his back; the dromedary has two. The camel also is the strongest and largest. The two races produce with each other, and the mixed breed formed between them is considered the best, the most patient, and most indefatigable.

The camel has a bunch on the back, small head, little ears, long neck and bending; about six feet six inches to the top of his bunch; soft hair, longest about the neck, throat, and bunch; tail long, hoofs small, divided, but not entirely; the soal excessively tough and pliant; has six callosities on the legs, one on each knee, one on the inside of each fore-leg on the upper joint, one on the inside of the hind-leg at the bottom of the thigh, another on the lower part of the breast, being the places on which the animal rests when lying down.

The camel is by far the most numerous, and is spread over the deserts of Arabia, Africa, Persia, Tartary, and great part of the eastern Indies, but cannot subsist, or propagate, in the variable climates towards the north; they seem formed for countries where shrubs are plenty, and water scarce; where they can travel along the sandy desert, without being impeded by rivers, and find food at expected distances; such a country is the desert of Arabia, and seems most adapted to this animal. They have been transported to Spain, to America, to Barbadoes, but without effect.

The camel is the most temperate of animals, and can travel several days without drinking. Its feet are formed for travelling upon sand, and utterly unfit for moist or marshy places; the Arabians, therefore, find a most useful assistant in this animal, where no other could subsist, and by its means cross those deserts with safety, which would be unpassable by any other method of conveyance. If the camel should slip, as in moist places it might, it would split asunder under a burden.

The natives could neither subsist, traffick, or travel without the camel; its milk and flesh make part of their nourishment; its hair, which it sheds yearly, their clothing; and if they fear an invading enemy, their camels convey them in a single day above an hundred miles. All the

armies upon earth might be lost in pursuit of a flying squadron mounted on camels.

The camel is easily instructed in the methods of taking up and supporting his burthen; their legs, a few days after they are produced, are bent under their belly; they are then loaded, and taught to rise; their burthen is daily insensibly increased. Equal care is taken in making them patient of hunger and thirst: while other animals receive their food at stated times, the camel is restrained for days together, and these intervals of scarcity are increased in proportion as the animal seems capable of sustaining them. Their stomach is admirably formed by nature for long abstinence: besides the four stomachs, common to animals that chew the cud (and the camel is of the number), it has a fifth stomach, which serves as a reservoir, to hold a greater quantity of water than the animal has immediate occasion for. Here the fluid remains without corrupting, or being adulterated by other aliments: when the camel finds itself thirsty, it throws up a quantity of this water by a simple contraction of the muscles, into the other stomachs, and thus macerates its food.

In Turkey, Persia, Arabia, Barbary, and Egypt, all commerce is carried on by camels. Merchants and travellers unite in a body, to secure themselves from robbers. This assemblage is called a caravan; sometimes consisting of above ten thousand persons, and the number of camels often greater. These animals are loaded according to their strength, and of this each is so sensible, that when overloaded, he remains on his belly, refusing to rise, till his burthen be lessened. Large camels are capable of carrying a thousand weight, and sometimes twelve hundred; the dromedary from six to seven. In trading journeys, they seldom go above thirty, or five and thirty miles a day. Every evening, when they arrive at a stage, which is usually some spot of verdure, they feed at liberty, and eat as much in an hour, as will supply them for twenty four; they prefer coarse weeds, the thistle, nettle, casia, and other prickly vegetables; but their drivers supply them with balls of meal, of barley, or beans, as more permanent nourishment. These animals, having often gone the same track, are said to know their way precisely, even when their guides are bewildered. When they come within a few miles of their baiting-place, in the evening, they sagaciously increase their speed, and often trot with vivacity to their stage. They can discover water by their scent at half a league distance, and will hasten towards it, long before their drivers perceive it. They are enlivened

enlivened by the pipe and music, and this always forms part of their drivers' profession.

The humps on the back grow large in proportion as the animal is well fed, and are in substance not unlike the udder of a cow. The female goes with young about a year, and produces but one at a time. Camel's milk is abundant and nourishing, and mixed with water makes a principal part of the beverage of the Arabians. They ordinarily live from forty to fifty years.

There is a kind of dromedary which is swift, and used only to ride on, is trained for running matches, and to carry couriers, who travel an hundred miles a day for nine days together over burning sands. The African camels are very hardy, and pass dreadful deserts from Numidia to Ethiopia.

T H E L A M A .

THE Lama may be considered as the camel of the new world, and is every way smaller than that of the old. Resembles the camel, not only in its natural mildness, but its aptness for servitude, its moderation, and its patience. The Americans early availed themselves of its useful qualities.

They belong entirely to the new continent ; nor are they spread over all America, but chiefly among the Andes. They inhabit the highest regions of the globe, and seem to require the purest air. In Potosi, and other provinces of Peru, where they are numerous, they make the chief riches of their masters, Indians and Spaniards : their flesh is excellent food ; their hair, or rather wool, forms clothing ; and, in the most rugged and dangerous ways, they carry burthens of a hundred weight with safety. They go about fifteen miles a day ; their tread is heavy, but sure ; they descend precipices, and find footing among craggy rocks where men can scarce accompany them. After four or five days labour, they are obliged to repose for a day or two. They are chiefly used in carrying the riches of the mines of Potosi ; and we are told that there are above three hundred thousand of these animals in actual employ. Were used to plough the land before the introduction of mules.

This

This animal is about the size of an ass, some four or four and half feet high, and six in length; the neck three feet long, the head is small, its face resembling a camel, eyes large, nose long, lips thick, the upper divided, the lower a little depending; like all animals that feed on grass, wants the upper cutting teeth; the ears four inches long, move with great agility; the tail small, strait, a little turned up at the end; is cloven footed, like the ox, but has a kind of spear-like appendage behind, which assists it in moving over precipices and rugged ways; the wool on the back is short, but long on the sides and the belly; has smooth hair when tame, rough when wild; are mostly brown, but some white, black, or spotted.

The lama is extremely moderate in what it drinks, and exceeds even the camel in temperance. Indeed, of all creatures, it seems to require water least, as it is supplied by nature with saliva in such large quantities, that it spits it out on every occasion, and this saliva is its only offensive weapon; wherever it falls on the skin, it causes an itching and reddish spot.

These animals are found wild in very great numbers, and exhibit marks of very great force and agility; are in shape delicate and strong; colour tawney, wool short; in their native forests are gregarious animals, often seen in flocks of two or three hundred. When they perceive a stranger, they regard him with astonishment, without marking fear or surprise; but shortly, as if by common consent, they snuff up the air, somewhat like horses, and take refuge on the tops of the mountains: are fonder of the northern than the southern side of the Andes; often climb above the snowy tracts of the mountain, and seem vigorous in proportion to the coldness of their situation.

The lama seems to be the largest of the camel kind in America; there are others, called guanacoes and pacos, that are smaller and weaker, of the same nature and forms. The wool of the paco is formed into stuffs, not inferior to silk, either in price or beauty. The natural colour of the paco is that of a dried rose-leaf, or dull purple; the manufacturers seldom dye its wool, but form it into quilts and carpets.

H O G K I N D.

THE hog kind seem to unite those distinctions by which others are separated. They resemble the horse in the number of their teeth, which amount to forty-four, in the length of their head, and in having but one stomach. They resemble the cow in their apparently cloven hoofs, and the position of their intestines; and they resemble the rapacious kind in their appetite for flesh, in their not chewing the cud, and in their numerous progeny. Like them they have short intestines; their hoofs also, though apparently cloven, on anatomical inspection, appear formed with bones like beasts of prey; and the number of their teats increases the similitude.

The wild Boar is by no means so stupid nor so filthy, as that reduced to tameness; he is smaller; his colour an iron grey, inclining to black; his snout is much longer than that of the tame hog; ears shorter, rounder, and black. He roots up the ground like a furrow, and does irreparable damage in cultivated lands. The tusks of this animal are large, some of them almost a foot long. These grow from both the under and upper jaw, bend upwards circularly, and are exceeding sharp; they never fall; all the hog kind never shed their teeth. The tusks of the lower jaw are most to be dreaded, and give very terrible wounds.

The wild boar can properly be called neither solitary nor gregarious. The three first years the litter follows the sow, and the family lives together. They are then called beasts of company, and unite their forces against beasts of prey, calling to each other with a very loud and fierce note; the strongest face the danger, and the weakest fall into the centre. In this position few ravenous beasts dare attack them. When the wild boar is mature, and conscious of his strength, he walks the forest alone, and fearless.

The hog, in a natural state, feeds chiefly on roots and vegetables; seldom attacks other animals; but if an animal die in the forest, or is so wounded that it can make no resistance, it becomes a prey to the hog, who seldom refuses animal food, how putrid soever, though never at the pains of taking or procuring it alive. In America, feeds upon rattle-snakes with safety, and is in that respect very useful.

It is of all quadrupeds most delicate in the choice of vegetables, and rejects a greater number than others. The cow, we are assured by Lin-

næus, eats two hundred and seventy-six plants, and rejects two hundred and eighteen; the goat eats four hundred and forty-nine, and rejects an hundred and twenty-six; the sheep eats three hundred and eighty-seven, and rejects an hundred and forty-one; the horse eats two hundred and sixty-two, and rejects two hundred and twelve; but the hog eats only seventy-two plants, and rejects an hundred and seventy-one. The indelicacy of this animal is, therefore, rather in our apprehensions than in its nature; for, where it finds variety, it rejects the worst with as distinguishing a taste as any other quadruped whatsoever. In the orchards of peach-trees in North-America, where the hog has plenty, it will reject the fruit that has lain a few hours on the ground, and continue on the watch hours together for a fresh windfall.

The hog is stupid, inactive, and drowsy; would sleep half its time; but is frequently awaked by the calls of appetite, which having satisfied, goes to rest again. Its whole life is sleep and gluttony, in enjoyment of which it soon grows unfit even for existence; its flesh becomes a greater load than its legs are able to support, and it continues to feed lying down, or kneeling, an helpless instance of indulged sensuality. Is keen of smell; its fat disposed different from other animals in a regular coat over the whole body. When the wind blows with vehemence, is greatly agitated, runs violently to its sty, screaming horribly, which seems to indicate that it is naturally fond of a warm climate. It appears also to foresee bad weather, bringing straw in its mouth, preparing a bed, and hiding itself from the impending storm. When it hears any of its kind in distress, gathers round it, to lend fruitless assistance, and to sympathize with its sufferings. They have been known to gather round a dog that had teased them, and kill him on the spot. Nevertheless, is so brutal, as to eat its own offspring, and sometimes infants.

Most diseases of this animal arise from intemperance; measles, imposthumes, and scrophula. It is thought by some that they wallow in the mire to destroy a sort of louse that infests them; rather, perhaps, to cool their surfeited body. They generally live eighteen or twenty years; and the females produce till fifteen. As they produce from ten to twenty at a litter, twice a year, they would shortly become exceedingly numerous, if not diminished. In the wild state, the sow brings forth but once a year.

The wild boar was formerly native of our country, as appears from the laws of Hoel Dda, the famous Welch legislator, who permitted his grand huntsman to chase that animal from the middle of November to the

the beginning of December. William the Conqueror also punished such as were convicted of killing the wild boar in his forests, with the loss of their eyes. At present the wild breed is extinct; but no country makes greater use of the tame.

This animal is native of almost every country, except in the frigid zones and Kamtchatka, and where the cold is very severe. Since introduced into America by the Europeans, abounds to excess in the hot and temperate parts. The East-India breed is lower, less furnished with hair, usually black, and has the belly almost touching the ground; it is now common in England.

There is a remarkable variety of this animal about Upsal, which is single-hoofed, like the horse; but in no other respect differing from the common kinds. The Guinea hog differs also in some things from our own.

I have seen in the possession of an officer, who had served in the East-Indies, drawings of a pair of creatures exactly resembling hogs, except that they had only two legs, their hinder parts being held up in the air, as it were. They are natives of Ceylon, and were sent from thence to a Rajah (I believe) of Tanjore, where they were drawn. They walk with difficulty, and are not easily induced to rise.

These we consider as of the hog kind; there are other quadrupeds resembling this species, but very distinct, notwithstanding their general form or habits.

THE

AFRICAN WILD BOAR

DIFFERS from that of Europe, especially by its head; which is enormously large; has two tusks in the lower jaw, and two very large in the upper, rising almost perpendicular, near seven inches long. The under tusks exactly meet the upper when the mouth is shut. The head is flat in front, and ends in a considerable breadth of snout, almost of a horny hardness, with which he roots the earth; no fore teeth; his eyes are placed on the fore part of his head, so that he can only see before him. Beneath them is a very wrinkled kind of hollow, formed of loose skin; somewhat lower, the skin rises, and forms on each side an excrescence, which at a little distance resembles ears in size and figure, broad, flat, rounded at the end, lying almost in the same direction as the face, intercepting the view of every thing below from the animal;

between the excrescences and the tusks, is a large callous protuberance on each side the face; ears large and sharp pointed, well lined with long whitish hairs; tail naked, slender, and flat, not very long; hoofs divided; general colour blackish; grows to an enormous size; capable of tameness, in some degree at least, but irritable and capricious; naturally very swift and fierce; will not breed with the common sort; inhabits the hottest parts of Africa; little of its native manners known.

THE

PECCARY, OR TAJACU.

THE Peccary, or Tajacu, is native of America and the Antilles, found in herds of several hundreds together, grazing among the woods; inoffensive except when offended.

The peccary resembles a small hog in the form of its body, the shape of its head, the length of its snout, and the form of its legs; but the body is not so bulky, its legs not so long, its bristles much thicker and stronger than those of the hog, less resembling hair than the quills of a porcupine, but are not near so thick; are also variegated like the porcupine's. Instead of a tail, it has only a little fleshy protuberance, which does not even cover its posteriors. It differs from all other quadrupeds by having on its back a lump resembling the navel in other animals, which separates a liquor of a very strong smell. This lump, situated on the hinder part of the back, is, in general, so covered with long bristles, that it cannot be seen except they be drawn aside. A small space then appears, only beset with a few short fine hairs. In the middle it rises, and has an orifice capable of receiving a goose quill, about an inch in depth; round it, under the skin, are situated a number of small glands, which distil a whitish liquor, in colour and substance resembling that obtained from the civet animal; but offensive. While some creatures have these glands under the belly, or under the tail, the peccary has them on its back.

The belly is almost bare; the bristles on the sides gradually increase in length, as they approach the ridge of the back, where some are five inches long. On the head, between the ears, is a large tuft of bristles, chiefly black; ears are about two inches and a half long, standing upright; the eyes resemble those of a common hog, but smaller; the snout

is like a hog's, though small. One side of the lower lip is generally smooth, by the rubbing of the tusk of the upper jaw. The feet and hoofs are perfectly like those of a common hog.

The peccary may be tamed like a hog, and has pretty nearly the same habits and natural inclinations; feeds upon the same aliments; its flesh, though drier and leaner than that of the hog, is pretty good eating; and, when killed, not only the parts of generation must be taken instantly away, but also the lump on the back, with all the glands that contribute to its supply. If this operation be deferred only half an hour, the flesh becomes utterly unfit to be eaten.

They are particularly fierce when their young are assaulted; they surround the plunderer, attack him boldly, and frequently make his life pay the forfeit of his rashness. When any of the natives are pursued by a herd, they climb a tree to avoid them; the peccaries gather round it; by threatening with their tusks, and erecting their rough bristles (as hogs) they assume a very terrible appearance. Thus they remain at the foot of the tree hours together, while the hunter is obliged to wait patiently, and not without apprehensions, till they retire.

The peccary is fond of mountain-forests (not of marshes or the mud, like our hogs); it subsists on wild fruits, roots, and vegetables; is an unceasing enemy to the lizard, toad, and serpent, with which these uncultivated forests abound. As soon as it perceives a serpent, it seizes it with its fore hoofs and teeth, skins it in an instant with great dexterity, and devours the flesh. The jaguar is its mortal enemy, but often feels the force of their union. It is said there are two sorts of peccary; one large—the other small, and no enemy to marshes or mud, out of which it draws worms and insects.

The peccary is very prolific; the young ones follow the dam till they come to perfection. If taken at first, soon lose their natural ferocity; never shew any remarkable signs of docility, but continue stupid and rude, without attachment, or seeming to know the hand that feeds them. They seldom stray far from home; return of themselves to the sty; and do not quarrel among each other, except when fed in common. At such times have an angry kind of growl, much stronger and harsher than that of an hog, but are seldom heard to scream like the former; sometimes, when frightened or irritated, they have an abrupt angry manner of blowing like the boar.

The peccary is very distinct from the hog, and will not mix with it.

The Warree is the European hog, degenerated into a wild state in the forests of America,

THE

BABYROUESSA, OR INDIAN HOG.

THIS animal's figure, on the whole, most resembles that of the hog; has four cutting teeth in the upper, six in the lower jaw. Its legs are longer, its body more slender than a hog; its hair is finer, blackish, rather resembling wool than bristles, but along its back are some weak bristles; its tail is long, and also tufted with the same, often twisted; ears small, erect, sharp pointed. What principally distinguish it, are four tusks; the two largest (about twelve inches long) from the upper, the two smallest (about eight inches) from the under jaw. The jaw-bones of this extraordinary animal are very thick and strong, from whence these monstrous tusks proceed; they bend circularly, the two lower like those of the boar, the two upper rise from the upper jaw, rather like horns than teeth; and, bending upwards and backwards, sometimes have their points directed to the animal's eyes, and sometimes grow into them. The tusks in both jaws are of a very fine ivory, smoother and whiter than that of the elephant, but not so hard or serviceable.

These enormous tusks give this animal a very formidable appearance; yet it is thought to be much less dangerous than the wild boar. They go together in herds; often in company with the wild boar, with which, however, they are never known to engender; have a very strong scent, which discovers them to the hounds; and, when pursued, they growl dreadfully, often turning back upon the dogs, and wounding them with the tusks of the lower jaw, for those of the upper are rather an obstruction than a defence. They run much swifter than the boar; have a more exquisite scent, winding the men and the dogs at a great distance. When hunted closely, they generally plunge themselves into the sea, where they swim with great swiftness and facility, diving, and rising again at pleasure; fierce when offended; peaceable and harmless when unmolested. They are easily tamed; their flesh good, but said to putrefy in a very short time. They repose themselves by hitching one of their upper tusks on the branch of a tree; live upon vegetables and the leaves of trees; never break into gardens, like other swine; inhabit near Amboyne and Celebes,

T H E

D O G K I N D

MAY be distinguished by their claws, which have no sheath, like those of the cat kind, but are incapable of extension or retraction; nose and jaw long; body strongly made, covered with hair instead of fur; the intestines much longer in the dog than in the cat kind; the eye not formed for night vision; the olfactory nerves diffused on a very extensive membrane within the skull. They cannot, like cats, pursue their prey up trees, and among the branches, as their claws cannot stick in the bark; but their proper prey are animals like themselves, unfitted for climbing; the hare, rabbit, gazelle, or roebuck. By their sense of smelling, they pursue their prey with certainty, wind it through all its mazes, and tire it down by perseverance. When driven to extremity, the dog kinds can live for some time on fruits and vegetables.

Of all the tribe, the Dog claims the preference, as the most intelligent of quadrupeds, and our acknowledged friend. Independent of his beauty, vivacity, force, and swiftness, the dog possesses internal qualifications to conciliate our esteem. To please seems to be his ambition; he comes crouching to lay his force, courage, and talents, at the feet of his master; waits his orders, to which he pays implicit obedience; consults his looks, and a single glance puts him in motion; he is faithful and constant; friendly and grateful; much more mindful of benefits than of injuries; is not driven off by unkindness; he licks the hand just lifted to strike him, and disarms resentment by submissive perseverance; docile and obedient, he is quickly instructed, and conforms to the dispositions and manners of his masters; like the domestics, is disdainful among the great, churlish among clowns: assiduous in serving his master, and only a friend to his friends; knows a beggar by his clothes, his voice, or his gestures, and forbids his approach. When at night the guard of the house is committed to his care, seems proud of the charge; continues a watchful sentinel, goes his rounds, scents strangers at a distance, and gives them warning of his being upon duty. If they assault his territories, he becomes fierce, flies at them, threatens, fights, and, when he has conquered, quietly abstains from what he has deterred others from abusing: at once an example of courage, temperance, and fidelity.

Without the dog, how could man have been able to conquer and domesticate other animals? How could he discover and chase those noxious to him? The first art of man was to conciliate the favour of the dog; and the fruits of this art were, the conquest and peaceable possession of the earth. The generality of animals have superior agility, swiftness, or arms, than man; their senses, particularly smelling, are superior. The acquisition, therefore, of an assistant, especially one whose scent is so exquisite, was gaining a sense which before was wanting.

The dog, thus taken into office, exerts a superiority over all animals under human protection. The flock and the herd obey him; he conducts them, guards them, and considers their enemies as his own. When the sound of the horn, or the voice of the huntsman, calls him to the field, he pursues with pleasure and perseverance. All animals that live on flesh hunt by nature; the lion and the tiger, sure to conquer, hunt alone; the wolf, the fox, the wild dog, hunt in packs; but the domestic dog, when he has been taught by man, hunts with method, and with success.

The wild dog is at present unknown; yet there are many that, from a domestic state, have returned to wildness (or rather are without masters), and entirely pursue the dictates of nature; of these it is asserted, that when they have run down an animal, they still preserve so much respect for mankind, as to suffer part to be taken away without growling. Multitudes wild in Africa and South-America; they unite in large bodies, and attack the most formidable animals of the forest, the cougar, the panther, and the bison; even man himself does not pass without insult. But they are easily tamed; when taken home, and treated with kindness and lenity, they quickly become submissive and familiar, and continue faithfully attached to their masters. Different in this from the wolf or the fox, who, though taken never so young, are gentle only while cubs, and, as they grow older, obey their natural appetites of rapine. In short, the dog is the only animal whose fidelity is unshaken; who knows his master and his friends; who instantly distinguishes a stranger; who knows and answers to his name; who seems to understand the nature of subordination, and seeks assistance; who, when he misses his master, testifies his loss by complaints; who, carried to a distance, can find the way home. The only animal whose natural talents are always successfully improved by education.

The varieties of this animal are too many for the most careful describer to mention. Climate, food, education, produce alterations in

shape, colour, hair, size, and in every thing but its nature. Nothing appears constant, but internal conformation, and a capacity of producing among each other, through all their varieties, which determines the identity of the species, and approximates forms that at first sight seem never made for conjunction.

Which is the original animal is a question not easily solved. Probably that which most nearly approaches the wolf or the fox externally; for as the dog nearly resembles them internally, his external resemblance may naturally approach them also, except where art or accident has altered his form.

On this principle, we select that which is called the Shepherd's Dog, with long coarse hair, except on the nose, a long nose and pricked ears, which is common among us, and used in attending on sheep. If we examine countries still savage, or but half civilized, where the dog, like his master, has received few impressions from art, we find this dog, or one very like him, prevailing among them. Dogs that have run wild in America, and in Congo, approach this form. The dog of Siberia, Lapland, and Iceland, of the Cape of Good Hope, of Madagascar, Madura, Calicut, and Malabar, resembles the shepherd's dog. In Guinea, the dog speedily takes this form; and, at the second or third generation, forgets to bark, his ears and his tail become pointed, his hair drops off, and a coarser thinner kind succeeds it. Notwithstanding this creature's melancholy and savage air, he is superior to all of his kind in instinct; and, without teaching, naturally takes to tending flocks, with assiduity and vigilance.

The shepherd's dog, in temperate climates, and among people entirely civilized, will lose his savage air, his pricked ears, his rough, long, and thick hair, and by the influence of climate and food become either a *Matin*, a *Mastiff*, or a *Hound*.

The *Hound*, the *Harrier*, and the *Beagle* seem of one kind; for in the litters of a bitch covered by one, are found puppies resembling all three. This animal, transported into Spain or Barbary, where the hair of all quadrupeds becomes soft and long, will be converted into the *land-spaniel* and the *water-spaniel*.

The *Grey Matin Hound* (the second branch) transported to the north, becomes the great *Danish dog*; this, sent into the south, becomes the *grey-hound* of different sizes; transported into Ireland, the *Ukraine*, *Tartary*, *Epirus*, and *Albania*, becomes the great *wolf-dog*.

The Mastiff (the third branch) chiefly a native of England, when transported into Denmark, becomes the little Danish dog; which, in tropical and warm climates, becomes the Turkish dog without hair. These races, with their varieties, are produced by the influence of climate, food, and education.

Mixed kinds are so extremely numerous, and different in different countries, it would be endless to mention them. In our own country the varieties are very great, and daily increasing. In the time of queen Elizabeth, Dr. Caius attempted their natural history. Some he mentions are no longer found among us, many others are since introduced.

He divides dogs into three kinds. First, the generous kind, including the tarrier, the harrier, and the blood-hound; the gaze hound, the greyhound, the leymmer, and the tumbler; these are used for hunting. The spaniel, the setter, the water-spaniel, or finder, for fowling; and the spaniel gentle; or lap-dog, for amusement. Secondly, the farm kind, consisting of the shepherd's dog and the mastiff. Thirdly, the mongrel kind, consisting of the wappe, the turn-spit, and the dancer. To these we may now add, the bull-dog, the Dutch mastiff, the harlequin, the pointer, and the Dane, with a variety of useless lap-dogs.

The Tarrier is a small kind of hound, with rough hair, used to force the fox or the badger out of their holes; or rather to give notice by their barking, in what part of their kennel the fox or badger resides, when the sportsmen intend to dig them out.

The Harrier, as well as the Beagle and the Fox-hound are used for hunting; of all animals, they have the acutest sense of smelling.

The Blood-hound was of great use, and high esteem among our ancestors, for recovering game that had escaped wounded, or had been killed, and stolen; and for hunting thieves and robbers by their footsteps.

The Gaze-hound hunted, like our grey-hounds, by the eye only; chased the fox, hare, or buck; would select the fattest and fairest, and, if lost, recover it again with amazing sagacity. This species is now unknown.

The Grey hound, well known at present, was formerly the peculiar companion of a gentleman; who, in the times of semi-barbarism, was known by his horse, his hawk, and his grey-hound.

The Leymmer is a species now unknown. It hunted both by scent and sight, and was led in a leyme or thong, from whence it received its name.

The

The Tumbler, less than the hound, scraggy, and had pricked ears, seems to answer to the lurcher. This took its prey by mere cunning.

The Land-Spaniel (probably named from Spain, where it might acquire the softness of its hair) is well known. There are two varieties; the Starter, used in hawking to spring game, and the Setter, that crouches down when it scents the birds, till the net be drawn over them, an amusement known only in England.

The Water-Spaniel was another species used in fowling.

The Shepherd's Dog has been mentioned, and the Mastiff is too common to require description.

The Bull-Dog, Mr. Buffon supposes, is bred between the small Dane and the English mastiff. The large Dane is the tallest dog generally bred in England.

Of those of the foreign kinds, the Lion Dog greatly resembles that animal, in miniature. The hair on the fore part of the body is extremely long; on the hinder part short. The nose is short, the tail long and tufted. In these particulars entirely like the lion. It comes originally from Malta, where it is so small, that women carry it about in their sleeves.

That falsely called the Turkish Dog, differs in being entirely without hair. The skin is of a flesh colour, with brown spots, and their figure at first view rather disgusting. They are extremely chilly, unable to endure our climate, and in the midst of summer always shivering; in winter their spots entirely disappear.

The Great Irish Wolf-Dog may be considered as the first of the species in regard to size, being sometimes four feet high, or as tall as a calf of a year old; made like a greyhound, but rather more robust.

In China are dog-butchers, and shambles appointed for selling their flesh. In Canton particularly; and wherever a dog-butcher appears, all the dogs of the place follow him in full cry, and persecute him as far as they are able.

The dog, when whelped, is not complete, the eyes being closed by a kind of thin membrané, which is torn as soon as the upper eye-lid becomes strong enough to raise it, which in general requires ten or twelve days. During that time, the bones of the skull are not completed, the body is puffed up, and the nose short. In less than a month the puppy begins to use its senses, and makes hasty advances. At the fourth month the dog loses some of his teeth, which are renewed by such as never fall. These amount to forty-two. The teeth of the dog being his
great

great and only weapon, are formed in the most serviceable manner. He cuts with his incisors, or fore-teeth, he holds with his four great canine teeth, and he chews with his grinders; these are fourteen in number, and so placed that, when the jaws are shut, there remains a distance between them, so that the dog, by opening his mouth ever so wide, does not lose the power of his jaws. The bitch goes nine weeks with young; lives to about twelve years. Will not eat many kinds of birds; is voracious, yet can bear hunger long; drinks often, though not abundantly; and it is commonly believed, that when abridged in water, he runs mad; but perhaps not so often as has been asserted.

T H E W O L F.

THE Dog and the Wolf are very much alike internally, and externally some dogs rather resemble the wolf than each other.

The wolf is about three feet seven inches long, and about two feet five inches high; which shews him to be larger than our mastiffs. His colour a mixture of black, brown, and grey, extremely rough and hard, mixed toward the roots with a kind of ash-coloured fur. He appears stronger than the dog; and the length of his hair contributes to this effect. The wolf's eye opens slantingly upwards, in the direction of the nose; whereas, in the dog, it opens more at right angles with the nose, as in man; his tail also is long and bushy, and he carries it rather more between his hind legs than the dog. The wolf's eye-balls are fiery green, and add to the fierce and formidable air of his visage.

The wolf's appetite for animal food is most vehement. Nature has furnished him with strength, cunning, agility, and all requisites for pursuing, overtaking, and conquering; yet, with all these, the wolf most frequently dies of hunger, for he is the declared enemy of man. He is naturally dull and cowardly; but, frequently disappointed, and reduced to famine, he becomes ingenious from want, and courageous from necessity. When pressed with hunger, he sallies forth over the country, keeps peering round the villages, carries off such animals as are not under protection, attacks the sheep-folds, scratches up and undermines the thresholds of doors where they are housed, and destroys all before he fixes on and carries off his prey. When these sallies fail, he returns to the thickest part of the forest to pursue smaller animals, which, when
taken,

The Black Wolf

taken, afford him but a scanty supply. He there goes regularly to work, follows by the scent, opens to the view, still keeps following, if hopeless himself of overtaking, expecting that some other wolf will come to his assistance, and then content to share the spoil. At last, when his necessities are very urgent, he boldly faces certain destruction; he attacks women and children, sometimes men; becomes furious by continual agitation, and ends his life in madness.

The wolf apparently resembles the dog; yet only offers the reverse of the medal. If his form be like, his nature is different; he preserves the ill qualities of the dog, without any of his good ones. No two animals can have a more perfect antipathy to each other. A young dog shudders at the sight of a wolf; he even shuns his scent, which, though unknown, is so repugnant to his nature, that he comes trembling to take protection near his master. A dog who is stronger, and knows his strength, bristles up and testifies his animosity, attacks him with courage, and exerts his abilities to rid himself of a hateful presence. They never meet without animosity, fighting for life and death, and without mercy on either side. If the wolf is the stronger, he devours his prey: the dog contents himself with victory, leaving his enemy, when he falls, as food for birds of prey, or for other wolves, since they devour each other; when one wolf is desperately wounded, the rest track him by his blood, and complete his disaster.

Dogs, of the dullest kinds, seek company; but the wolf is the enemy of all society, even among those of his kind; their association is not society, but a combination for war: their loud howlings and fierceness discover a project for attacking some great animal, a stag or a bull, or some more redoubtable watch-dog. The instant their military expedition is completed, their society ends, and each returns in silence to his solitary retreat. There are but slight attachments between the male and female; they seek each other but once a year, and remain together but a few days; they couple in winter; several males often follow one female, and this association is still more bloody than the former; they dispute most cruelly, growl, bark, fight, and tear each other; and sometimes the majority kill that wolf which has been chiefly preferred by the female.

The time of pregnancy is about three months and a half; young wolves are found from the latter end of April to the beginning of July. The long continuance of the wolf's pregnancy adds a distinction between it and the dog. They generally bring five or six, sometimes nine

cubs, with the eyes closed; the dam suckles them some weeks, and teaches them betimes to eat flesh, which she prepares for them, by chewing it first herself. Some time after she brings them stronger food, hares, partridges, and birds yet alive. The young wolves begin by playing with them, and end by killing them. The dam then strips them of their feathers, tears them in pieces, and distributes them. They do not leave the den till they are six weeks or two months old. When they are about ten or twelve months old, have shed their first teeth, and completed the new, she thinks them able to shift for themselves. She hides the place of her retreat from the male, lest he should devour her cubs.

The wolf grows grey by age, and his teeth wear by using. He sleeps when satisfied or fatigued, rather by day than night; and always is very easily waked. He drinks frequently; though very voracious, supports hunger for a long time, and often lives four or five days without food, provided he be supplied with water; to allay hunger will eat mud. He carries off a sheep in his mouth without letting it touch the ground, and runs with it much swifter than the shepherds who pursue him; so that only the dogs can overtake and oblige him to quit his prey. He bites cruelly, always with greater vehemence in proportion as he is least resisted; for he uses precautions where he meets defence. He is ever cowardly, and never fights but by necessity. When wounded by a bullet, he screams; yet, when surrounded by the peasants, and attacked with clubs, he defends himself in silence, and dies as hard as he lived.

He travels, runs, and plunders, days and nights together; is indefatigable; and perhaps of all animals the most difficult to be hunted down. If caught in a pit-fall, he is for some time so frightened and astonished, that he may be killed, or taken alive, without much danger; may be collared, muzzled, and dragged along safely. At all other times he has his senses in great perfection; his eye, his ear, and (particularly) his smelling. He smells a carcase at more than a league's distance. When he leaves the wood, he takes care to go out against the wind; at its extremity, he examines, by his smell, on all sides, emanations of his enemy or his prey, which he nicely distinguishes. He prefers animals which he kills himself, to those he finds dead; yet he does not disdain these when without better. He is particularly fond of human flesh, and perhaps, were he sufficiently powerful, would eat no other. Gesner tells us of a friar, a woman, and a wolf, being taken in a pit-fall in
the

the same night. The woman lost her senses with the fright, the friar his reputation, and the wolf his life.

King Edgar is said to be the first who attempted to rid this kingdom of such disagreeable inmates, by commuting the punishment for certain crimes into the acceptance of a number of wolf's tongues or heads from each criminal. However, some centuries after, these animals were again increased to such a degree, as to become a public nuisance. Edward the First issued out his mandate to Peter Corbet to superintend and assist in their destruction. They are said to have infested Ireland long after they were extirpated in England.

Beside the common wolves in France and Germany, there are others with thicker hair, inclining to yellow. These are more savage and less noxious, neither approaching the flocks nor habitations, and living rather by the chase than rapine. In the northern climates are found some quite black, and some white all over. The former are larger and stronger than those of any other kinds.

The species is very much diffused in every part of the world, being found in Asia, Africa, and in America, as well as Europe. The wolves of Senegal resemble those of France, except that they are larger and much fiercer than those of Europe. They prey in company with the lion. Those of Egypt are smaller than those of Greece. In the East, the wolf is trained up for a shew, being taught to dance and play tricks; one thus educated often sells for four or five hundred crowns. It is said, that in Lapland the wolf will never attack a rein-deer that is haltered; the wary animal, being well acquainted with the nature of a trap, suspects one wherever he perceives a rope. However, when he sees the deer at liberty, he seldom fails to destroy it.

The wolf of North-America is blacker and much less than others, and approaches nearer to the dog. In fact, they were used as such by the natives, till the Europeans introduced others; and even now, on the remoter shores, or the more inland parts, they use these animals in hunting. They are tame and gentle; and the wild ones of this kind neither so large nor fierce as an European wolf, nor do they attack mankind. They go in large packs by night to hunt the deer, which they do as well as any dogs in England; and it is confidently asserted that one of them can run down a deer; do not bark, but use a kind of howl. Catesby says, they have engendered with the European dogs, and that their breed has become prolific; which proves them to be of the same species. Similar facts have occurred in London.

The Mexican wolf has a very large head, great jaws and teeth, and is a voracious animal.

Wolf's flesh is very indifferent, and seems to be disliked by all other animals, no creature being known to eat it, except a wolf. He breathes a most foetid vapour from his jaws, as his food is indiscriminate, often putrid, and seldom cleanly. In short, every way offensive, by a savage aspect, a frightful howl, an insupportable odour, a perverse disposition, and fierce habits, he is hateful while living, and useless when dead.

T H E F O X.

THE Fox is slenderer than the wolf, and not near so large; about two feet three inches high. The tail of the fox is longer in proportion, and more bushy; its nose smaller, and hair softer; its eyes hazel, obliquely situated like those of the wolf, and its ears are directed in the same manner; its head is equally large in proportion to its size. It has a strong offensive smell peculiar to the species, and often the cause of their death.

The fox has ever been famous for cunning and art, not without meriting his reputation. Not attempting to oppose the dogs or the shepherds, neither attacking the flock, or alarming the village, he gains by his address what is denied to his strength or courage. Patient and prudent he waits opportunity, and varies his conduct. His study is self-preservation; nearly as indefatigable, actually swifter than the wolf, he does not trust to these qualities, but retires, in case of necessity, to an asylum, where he avoids danger, and brings up his young.

A home supposes a superior degree of instinct; the choice of situation, the art of making it convenient, of securing and concealing it, are marks of superior skill. The fox generally keeps his kennel, which is often a badger's hole, at the edge of a wood, within an easy journey of some neighbouring cottage. Thence he listens to the crowing cock and the cackling fowls. He scents them, seizes his opportunity, conceals his approaches, creeps slyly along, and seldom returns without his booty. In a yard he levels all the poultry; carries off part of the spoil, hides it at some convenient distance, and again returns to the charge. He hides others also, but not in the same place; and this for several

times together. When he finds birds entangled in springes, the fox is beforehand, very expertly takes the bird out of the snare, hides it three or four days, and knows exactly when and where to return to his hidden treasure. He is equally alert in seizing young hares and rabbits, and if old ones are wounded or fatigued, he is sure to profit by their moments of distress. He finds out birds nests, seizes the partridge and the quail sitting, and destroys a large quantity of game. In short, nothing comes amiss; rats, mice, serpents, toads, and lizards. When urged by hunger, he will eat vegetables and insects. Those near the sea-coasts eat crabs, shrimps, and shell-fish. The hedge-hog vainly rolls itself into a ball; this determined glutton teizes it till it unrolls, and then devours it. He attacks the wasp and the wild bee with equal success; at first they oblige their invader to retire, but in a few minutes he has rolled himself on the ground, and crushed such as stick to his skin, he then returns to the charge, and by perseverance, obliges them to abandon their combs, which he greedily devours, both wax and honey.

His scent is strong, but soon evaporated. His shifts to escape, when retreat is cut off to his kennel, are various and surprising. He chooses the most woody country, and takes the paths most embarrassed with thorns and briars; flies in a direct line before the hounds, though at no very great distance; manages his strength; takes to the low and plashy grounds, where the scent will least lie; and, when overtaken, defends himself with a desperate obstinacy, and fights in silence to the very last.

The fox's litter is generally from four to six. The female goes with young about six weeks, seldom stirs out while pregnant, but makes a bed for her young, and uses every preparation. If her retreat is discovered, and her young disturbed during her absence, she removes them one after the other in her mouth. The cubs are born blind, are eighteen months or two years in coming to perfection, and live about twelve or fourteen years.

The fox makes and suffers general war. The dog hunts him with peculiar acrimony; the wolf pursues him to his very retreat; the birds attend his excursions, and give warning of their approaching danger. The daw, the magpye, and the black-bird, perching on the hedges as he creeps below, with their cries apprise other animals; a caution which they perfectly understand and practise.

The generality of the foxes are red; but there are some, though not in England, greyish.

The

The greyhound fox is the largest, tallest, and boldest, and will attack a grown sheep. The mastiff fox is less, but more strongly built. The cur fox is the least and most common; he lurks about hedges and out-houses, and is the most pernicious.

Around the pole, the foxes are of all colours; black, blue, grey, iron-grey, silver-grey, white, white with red legs, white with black heads, white with the tip of the tail black, red with the throat and belly entirely white, and lastly with a stripe of black running along the back, and another crossing it at the shoulders. The common kind is generally diffused, being found in Europe, in the temperate climates of Asia and America; but rarely in Africa, and under the torrid zone. Blue fox skins are bought with avidity from their scarceness; but the black fox skin is most esteemed, a single skin often selling for forty or fifty crowns. The hair of these is so disposed, that it is impossible to tell which way the grain lies; if we hold the skin by the head, the hair hangs to the tail; if we hold it by the tail, it hangs down equally smooth to the head.

T H E J A C K A L L

IS said to be the size of a middling dog, resembling the fox in the hinder parts, particularly the tail; and the wolf in the fore-parts, especially the nose. Its legs are shorter than those of the fox, and its colour a bright yellow or forrel.

The species is diffused over Asia and Africa, as it were a substitute for the wolf, where that is not common. There seem to be many varieties; those of the warmest climates are largest, and their colour rather a reddish brown, than that beautiful yellow of the smaller jackall.

Its cry is a howl, mixed with barking, and a lamentation resembling that of human distress. It is noisy and voracious; goes always in a pack of forty or fifty, sometimes two hundred; hunt from evening to morning; nothing can escape them; they destroy the smaller animals, yet united, have courage to face the largest. Very little afraid of mankind, they pursue their game to the very doors, and will destroy children. They enter the sheep-folds, yards, and stables, when they can find nothing else, destroy leather harness, boots, and shoes, and run off with what they have not time to swallow. They scratch up with their feet

feet new-made graves, and devour the corpses how putrid soever; to prevent which, the earth over the graves is mixed with thorns. While they are at this dreary work, they exhort each other by a cry, resembling that of children under chastisement. When they have dug up a body, they share it. When they have once tasted human flesh, ever after pursue mankind: They watch burying-grounds, follow armies and caravans. To these vultures of quadrupeds, every thing that once had life seems equally agreeable.

The jackall that first scents some larger beast, gives notice by a howl, which it repeats as it runs; while all within hearing join the chase and cry, which is so loud, people can scarce hear each other speak. Often the lion, the tiger, or the panther, follow in silence at some distance: The jackall pursues the whole night, keeps up the cry, and with perseverance tires down its prey; just at that moment in comes the lion or the leopard, and the jackall must be content with the remnant he leaves. Between the jackall and dog is an irreconcilable antipathy, and they never part without an engagement. The jackall is as stupid as impudent; if one has stolen silently into an out-house, to seize the poultry, hearing others at a distance, it answers the call, and betrays its own depredations.

THE

ISATIS, OR ARCTIC FOX,

MAY be considered as between the dog and the fox. Resembles a fox in its form and length of tail; and a dog, in its head, the position of its eyes, and its barking. The hair is soft, some blue, some white at one season, at another russet brown. Its hair is two inches long, thick, tufted, and glossy, yet the under jaw is bare and without any.

This animal can bear only the coldest climates, the coasts of the Icy sea, and the great rivers around it; is mostly found in the mountainous and naked regions of Norway, Siberia, and Lapland. Burrows like the fox; sometimes two or three in a hole, in Groenland; when with young, the female retires to her kennel in the same manner. These holes, which are very narrow and extremely deep, have many outlets, are kept very

clean, and bedded with moss. Its time of gestation and number of young are similar to the fox; brings forth in May or June.

Its most striking peculiarity remains to be mentioned, namely, its change of colour, being at one time brown, at another white; the blue never change colour, but some are, when brought forth, of a yellow hue, which, in the beginning of September, gradually changes to white; its fur is then two inches long; in May this begins to fall, and about the middle of July the isatis again becomes brown.

T H E H Y Æ N A

IS nearly the size of a wolf, and has some similitude to that animal in shape. The head at first sight agrees, except that its ears are longer and more bare of hair; observing closely, we find the head broader, the nose flatter, and not so pointed; nor are the eyes placed obliquely; fore legs longer than the hinder; the feet different from all other quadrupeds, in having but four toes, as well before as behind. Its coarse hair is a dirty greyish, marked with black, disposed in waves down its body. Its tail is short, with pretty long hair; immediately under it, above the anus, is an opening into a kind of glandular pouch (which separates a substance of the consistence, but not the odour, of civet), in which it is resembled only by the badger. It holds its head somewhat like a dog pursuing the scent, with the nose near the ground, by which the back appears elevated, which is augmented by a long bristly band of hair that runs down it.

Savage and untameable, ever in a state of rage or rapacity, ever growling; except when receiving food; then its eyes glisten, the bristles of its back stand upright, its head hangs low, and yet its teeth appear; a most frightful aspect, heightened by a dreadful howl, which is very peculiar: its beginning resembles the voice of a man moaning, its conclusion a violent effort to vomit, or a kind of gross guttural laughing haw! haw! It seems the most untractable of quadrupeds; its courage equals its ferocity; it defends itself against the lion, is a match for the panther, attacks the ounce, and seldom fails to conquer.

Is a solitary animal; native of the most desolate and uncultivated parts of the torrid zone; resides in caverns of mountains, clefts of rocks, in dens formed by itself. Though taken young, cannot usually be tamed; it

The Hyæna.

it lives by depredation, sometimes attacks man, carries off cattle, follows the flock, breaks open the sheep-cots by night, and ravages with insatiable voracity. Its eyes shine by night; and it is asserted, not without great appearance of truth, that it sees better by night than by day. When destitute of other provision, it scrapes up the graves, and devours the dead bodies, how putrid soever.

Beside the striped hyæna, there is also a spotted hyæna, of congenial form and manners.

THE

CAT KIND.

THE Cat kind are distinguished by their claws, which they can hide or extend at pleasure. They seek their food alone: and, except at certain seasons, are enemies to each other. They devour nothing but flesh, and starve on other provision; ever fierce, rapacious, subtle, and cruel; unfit for society among each other, and unprofitable were they added to our list of domestics. Lions have been tamed so far as to become pageants of savage state; and tigers have been subdued, but at too great trouble and risque to encourage the practice.

Though differing in size or colour, they are nearly allied, and one is a specimen of the whole. All the kind are inflexible in their forms, and wear the print of their natural wildness strong upon them. The cat kind are also remarkable for their sharpness and strength of claws (whose gripe is extremely tenacious), their shortness of snout, their roundness of head, and their large whiskers on the upper lip. Their teeth, in number thirty, are very formidable, but rather calculated for tearing their prey than for chewing. They feed but slowly, and while eating, growl, to deter others. Their hinder parts are much weaker than those before, and seem less made for strength than agility. Nor are they swift, but rather surprise their prey than hunt it. They seize it with a bound, expressing their fierce pleasure with a roar; timid and cowardly, they seldom attack without advantage, but fly when the force opposing them is superior or equal. The lion himself will not venture a second attempt, where he has been once repulsed.

The Cat, the only one of the kind taken under human protection, is a faithless friend, opposed to a more insidious enemy. The services of the cat alone equal the trouble of raising it; and its strength is not sufficient to render its anger formidable. The lion or the tiger, if tamed, are dangerous by their strength. The cat has only the appearance of attachment, as may easily be perceived by its timid approaches, and side-long looks.

The cat goes with young fifty-six days; brings five or six at a time. The female usually hides her retreat from the male, who would devour her kittens. She suckles them some weeks, and accustoms them sometimes to rapine. Lives about ten years; is extremely vivacious, and holds out long ere it dies. Kittens are playful and amusing; but their sport soon becomes malice. They early shew a disposition to cruelty; often look wistfully towards the bird-cage, or sit centinels at the mouth of a mouse-hole, and shortly become expert hunters.

We are told of the Greek monks of the isle of Cyprus, teaching cats to hunt the serpents with which the island is infested. Birds, rabbits, hares, rats, mice, bats, moles, toads, frogs, are equally pursued, though not, perhaps, equally acceptable. The mouse seems to be the favourite. The cat has the sense of smelling but meanly. Of all the marks by which the cat discovers its natural malignity, that of playing and sporting with its little captive, before killing it outright, is the most flagrant.

In the eyes of cats, the contraction and dilatation of the pupil, is so considerable, that the orifice, which by day appears narrow, by night expands over the whole surface of the eye-ball, and their eyes seem on fire. By this conformation, they see best in darkness.

The cat is particularly fearful of water, of cold, and of ill smells; loves to keep in the sun, to enjoy the fire, and to rub itself against those who carry perfumes; is excessively fond of some plants (valerian, marum, and cat-mint); these it smells at a distance, rubs against them, and, if they be planted in a garden, wears them out. It loves fish, as well boiled as raw; it sleeps very lightly; often seems to sleep, the better to deceive its prey; treads very softly, and without noise; is cleanly to the last degree. Its fur is usually sleek and glossy; easily electrified, sending forth sparks if rubbed in the dark.

The wild cat breeds with the tame; is larger than the house cat; its fur being longer, gives it a greater appearance than it really has; its head is bigger, and face flatter; the teeth and claws much more formidable;

dable; its muscles very strong, as being formed for rapine; the tail of a moderate length, very thick and flat, marked with alternate bars of black and white, the end always black; the hips, and hind part of the lower joints of the leg, always black; the fur very soft and fine: the general colour of these animals, in England, is a yellowish white, mixed with a deep grey. These colours, though apparently blended, yet are disposed like the streaks of the tiger, pointing from the back downwards, rising from a black list that runs from the head along the middle of the back to the tail. This animal is the most destructive of the carnivorous kinds in this kingdom; inhabits mountainous and woody parts, living mostly in trees, and feeding by night. It should seem that these are not original inhabitants of this kingdom, but from a domestic state, became wild by ill usage or neglect. By the laws of Howel, the Welch prince, the price of a kitten, before it could see, was a penny; then two-pence; when it commenced mouser, four-pence: it was required, besides, that it should be of perfect hearing and sight, be a good mouser, have the claws whole, and be a good nurse. If it failed in any of these qualities, the seller was to forfeit to the buyer the third part of its value. If any one stole or killed the cat that guarded the prince's granary, he was to forfeit a milch ewe, its fleece and lamb, or as much wheat as, when poured on the cat suspended by the tail (the head touching the floor) would form an heap high enough to cover the tip of the tail.

In our climate we know but of one kind of wild cat: there are but few differences in this quadruped. Of all quadrupeds the wild cat has intestines smallest and shortest. Those of the sheep, for instance, unravelled and measured, will extend thirty times the length of its body; whereas the wild cat's intestines will not be found above three times the length of its body, and are, by one third, shorter than those of the tame. If we say the domestic cat has intestines enlarged to the quantity of its food, this observation is contradicted in the wild boar and the wolf, whose intestines equal those of the hog or the dog, though, like the wild cat, fed by precarious subsistence.

Wild cats were common also in Peru before its discovery, though not domestic. They abound in Africa, and many parts of Asia. Some are of a peculiar colour, inclining to blue. Pietro della Valle informs us, there is a kind of cat, particularly in the province of Chorazan, in Persia, of the form of the ordinary one, but infinitely more beautiful in the lustre and colour of its skin, which is grey blue, as soft and shining as silk; tail very long, covered with hair six inches long, which the animal
throws

throws upon its back like a squirrel. These cats are well known in France; and have been brought into England, under the name of the *blue cat*, which ill expresses their colour.

Another variety is the cat of Angora; larger than the common cat; their hair is much longer, hangs about their head and neck; some white, others dun. There are other varieties in this animal, but rather in colour than form, as the tortoise-shell cat, and others.

T H E L I O N.

THE Lion, produced under the burning sun of Africa, is the most terrible, the most undaunted of animals; but those bred in more temperate climates, or on the upper parts of lofty mountains, are far less dangerous, and have neither the strength nor ferocity of the lions of Biledulgerid or Zaara, where the plains are covered with burning sands. Happily the species is not very numerous, and seems to be diminishing as well in Lybia, as in Turkey, Persia, and the Indies, occasioned by the increase of mankind, the only animal in nature capable of effectually contending against these tyrants of the forest. The arms, even of an Hottentot or a Negro, render them more than a match for this powerful creature. This superiority serves also to alarm and discourage him, for he is brave only in proportion to his former success. The habit of conquering renders him intrepid and terrible. Those which never experienced the power of man, have no apprehensions. They boldly face him, and seem to brave the force of his arms. Wounds rather provoke their rage, than repress their ardour. A single lion of the desert will attack an entire caravan, and, after an obstinate contest, when overpowered, instead of flying, he continues to combat, retreating, and facing the enemy till he dies. Whereas the lions which inhabit the peopled countries of Morocco or India, acquainted with human superiority, have lost their courage, are scared with a shout, and seldom attack any but flocks or herds, which women and children are sufficient to protect.

When the lion is bred with domestic animals, he will play innocently and familiarly among them; and seldom exerts his natural ferocity against his benefactors. His anger is noble; his courage magnanimous; his disposition grateful. He despises contemptible enemies, and neglects their insults when he might punish them. He has been seen to spare the
lives

lives of such as were thrown to be devoured by him, to live peaceably with them, to afford them a part of his subsistence, and sometimes to want food himself, rather than deprive them of that life his generosity had spared. The lion is not cruel, since he never kills more than he consumes. When satiated, he is gentle; while the tiger, the wolf, the fox, and others, kill without remorse, are fierce without cause, and, by their indiscriminate slaughter, seem rather to satisfy their malignity than their hunger.

His figure is striking, his look confident and bold, his gait proud, his voice terrible. His stature is compact, well proportioned, and sizeable; a perfect model of strength, joined with agility; muscular and bold, not charged with unnecessary fat or flesh. It is sufficient to see him, to be assured of his superior force. His large head, surrounded with a dreadful mane; his muscles, swelling with the slightest exertions; the great breadth of his paws, and the thickness of his limbs, evince that no animal in the forest can oppose him. He has a very broad face that, as some have imagined, resembles the human; surrounded with long hair, which gives it a very majestic air. The top of the head, the temples, the cheeks, the under jaw, the neck, the breast, the shoulder, the hinder part of the legs, and the belly, are furnished with it, while all the rest of the body is covered with very short hair, of a tawny colour. The hair about the neck and breast differs from the rest only in length; nor is each hair pointed as in most other animals, but of equal thickness throughout. The neck has seven joints, which is universal to all quadrupeds. The tongue is rough, beset with prickles as hard as a cat's claws; their grain turned backwards, so that should a lion attempt to lick a man's hand, as we are told, it might tear off the skin. The eyes are always bright and fiery; nor even in death does this terrible look forsake them. The structure of the paws, teeth, eyes, and tongue, are the same as in a cat; and the inward parts of these animals so nearly resemble, that the anatomist's chief distinction arises merely from the size. The lion's mane grows longer as the animal grows older: the lioness is without this ornament. This mane is not coarse or rough, but of the same hair with the body, lengthened and shining. The lion's colour is yellow or tawny throughout the species.

The lion has not the sense of smelling equal to most other animals; and too strong light greatly incommodes him. His eyes, like those of the cat, seem fitted for seeing best in the dark; he therefore seldom appears in open day, but ravages chiefly by night. All animals of the cat

kind are kept off by fires, whereby the inhabitants preserve their herds and flocks. The bright flame dazzles them, and they fear to venture blindly among their enemies. They hunt rather by sight than smell.

The lion, when hungry, boldly attacks all animals; but as all avoid him, he is often obliged to hide, in order to surprise them. He crouches on his belly in some thicker, or among the long grass of the forest, with patient expectation, till his prey comes within distance; then he springs fifteen or twenty feet, and often seizes it at the first bound. If he misses, and in two or three reiterated springs cannot seize his prey, he continues motionless for a time, seems very sensible of his disappointment, and waits for a more successful opportunity. In the deserts and forests, his usual prey are the gazelles and the monkeys, with which the torrid regions abound. The latter he takes when on the ground, for he cannot climb trees. He devours a great deal at a time, and generally fills himself for two or three days. His teeth are so strong, that he easily breaks the bones and swallows them. It is reported that he sustains hunger long, but not thirst, his temperament being extremely hot; some have asserted that he is in a continual fever. He drinks water, lapping it like a cat. He generally requires about fifteen pounds of raw flesh daily; prefers that of live animals; seldom eats what begins to putrefy, and chooses rather to hunt for fresh spoil, than to return to what he had half devoured. His breath is very offensive, and his urine insupportable.

The roaring of the lion, when heard in the night, and re-echoed by the mountains, resembles distant thunder. This roar is his natural note; when enraged he has a different growl, short, broken, and reiterated. The roar is a deep hollow growl, which he sends forth particularly before rain. His cry of anger is much louder, and more formidable. This is excited by opposition. When the lion summons up all his terrors, nothing can be more terrible. He lashes his sides with his long tail, which alone is able to knock down a man; his mane rises stiffly round his head; his face is all agitation; his huge eye-brows half cover his glaring eye-balls; he shews his teeth, formed for destruction, his tongue covered with points, and his claws almost as long as a man's fingers. Thus prepared, few animals will venture an engagement; and the boldness of the human kind are daunted. The elephant, the rhinoceros, the tiger, and the hippopotamos, are the only animals that singly dare oppose him. The leopard and the wild boar, if provoked, will sometimes abide his approach, and wait his onset, which he seldom makes, unless compelled by hunger; they are sometimes successful. These instances are

rare;

rare; for the lion is in general undisputed lord of the forest. Man only attacks him with success, by the assistance of dogs and horses trained to the pursuit. These animals, that naturally would have fled from the lion in an agony, conscious of human aid, pursue in turn, and boldly hunt their tyrant. The dogs are of the large breed; and the horses, as Gesner assures us, of that sort called *charossi*, or lion-eyed; all others flying the sight of a lion, and endeavouring to throw their riders. The lion, when roused, recedes slowly, never goes off direct, but takes an oblique course, going from side to side, and bounding rather than running. He is very vivacious, never killed at once, but fights desperately, even after he has received his mortal blow. He is also taken by pit-falls. The usual manner of taking this animal is while a cub; the place near the den of the lioness is generally well known by the greatness of her depredations on that occasion. The natives watch the absence of the lioness, and, aided by a swift horse, carry off her cubs, which they sell to their great men or to strangers.

The lion seldom quits the forest while able to subsist by his activity; but when old, and unfit for surprise, he boldly comes down into places more frequented; attacks the flocks and herds, notwithstanding the habitation of their keeper, and depends on his courage for support. If he finds men and quadrupeds in the same field, he only attacks the latter, unless the men provoke an engagement. He prefers the flesh of camels and of young elephants, which he often attacks before their trunks are grown.

The lioness brings forth in spring; she goes with young about five months; brings never more than two, about the size of a large pug dog, harmless, pretty, and playful; they continue the teat twelve months, and the animal is five years in coming to perfection.

The great lion, called Pompey, which died in the year 1760, was known to have been in the Tower above seventy years; and another, which was brought from the river Gambia, died aged about sixty-three.

The lioness, though less strong, less courageous, and less mischievous than the lion, becomes terrible when she has cubs. She then roams with fearless intrepidity; throws herself indiscriminately among men and animals; destroys without distinction; and loads herself with spoil, and carries it reeking to her cubs, whom she accustoms betimes to slaughter. She usually brings forth in inaccessible places; when she fears a discovery of her retreat, often hides her tracks, by running back her ground, or by brushing them out with her tail; sometimes also transports them to

another place, and, if obstructed, defends them with determined courage to the last.

The lion can subsist in temperate climates; and formerly even the south of Europe was infested by him. He is only found now in Africa and the East-Indies, where he grows to an enormous height. The lion of Biledulgerid is said to be nearly five feet high, and between nine and ten feet from the tip of the nose to the tail. The ordinary size is about four feet; the female being about one third less than the male.

The author of the *Œconomy of Nature* gives a wonderful relation of the instinct of lions. Amid the burning heat of Africa the pelican makes her nest; and in order to cool her brood, and accustom them to an element with which they must afterwards be familiar, she brings from afar, in her great gular pouch, sufficient water to fill the nest: the lion (and other wild beasts) approach and quench their thirst; yet never injure the unfledged birds, as if conscious their destruction would stop those grateful supplies.

T H E T I G E R.

THE ancients had a saying, *That as the peacock is the most beautiful among birds, so is the tiger among quadrupeds.* No quadruped can be handsomer. The glossy smoothness and brightness of his hair, the extreme blackness of its streaks, the bright yellow ground they diversify, are all eminently beautiful. To this is added an extremely elegant form, slender and delicate, expressing singular swiftness and agility. But this animal's disposition is as mischievous, as its form is admirable: fierce and savage beyond measure; neither can correction terrify, nor indulgence tame it. The caresses of its keeper have no influence on its manners, and correction only increases its fierceness and malignity. The tiger snaps at the hand that feeds it; seems to consider every object as its proper prey, which it devours with a look; and, though confined by bars and chains, makes fruitless efforts, as if to demonstrate its ferocity, though it cannot exert its power.

The principal distinction of the tiger, is the shape of its streaks, which run in the same direction as his ribs, from the back down to the belly, differing from the leopard, panther, and ounce, which are spotted. The tiger is often found bigger than the lion himself; is much slenderer
also,

also, its legs shorter, and its neck and body longer. It resembles almost exactly the cat in shape, especially the male; and, if we conceive a he-cat sufficiently magnified, he will afford a very apt idea of the tiger. Mr. Buffon was assured by one of his friends, that he saw a tiger, in the East-Indies, fifteen feet long, including the tail, for which allowing four feet, this animal must have been eleven feet from the tip of the nose to the insertion of the tail. Such is the royal tiger!

The tiger is fierce without provocation, and cruel without necessity; though glutted, is not satisfied with slaughter, but continues the carnage; its courage only inflamed by not meeting resistance. Among a flock or herd, levels all, and scarce finds time to appease its appetite, while intent on satisfying its malignity. The scourge of a country! it fears not mankind; beasts wild and tame experience its insatiable fury; often the young elephant and the rhinoceros, and sometimes the lion himself.

The tiger is found in Malabar, in Siam, in Bengál, and other Asiatic countries inhabited by the elephant or the rhinoceros. They frequent the sides of lakes and rivers, compelled by the thirst which in that torrid climate they often endure; and it is likely the tiger finds this a convenient situation to surprise many of those animals which resort thither from the same motives. It generally lurks where it has repeated opportunity of prey. When it has killed one, it often attacks others, swallowing their blood at large draughts, and seeming rather glutted than satiated with its abundance, it plunges its head up to the eyes in the body of its prey, and exhaults the corpse of blood, before it devours the flesh.

Captain Hamilton informs us, that in the Sundah Rajha's dominions are three sorts of tigers in the woods; the smallest is the fiercest, not above two feet high, extremely cunning, and fond of human flesh; the second about three feet high, hunts deer and wild hogs; the largest sort is above three feet and a half high, but not equally rapacious:

A peasant in that country, says this traveller, had a buffalo fallen into a quagmire; while he went for assistance, there came a large tiger, that alone drew forth the animal. When the people returned, the first object they beheld was the tiger, which had thrown the buffalo over its shoulder, as a fox does a goose, and was carrying it away, feet upward, towards its den; it had killed the buffalo, and sucked its blood. As some East-Indian buffaloes weigh a thousand pounds, we may from hence

hence form a conception of the enormous strength of this rapacious animal. As to its agility, we may guess at it, by observing the distance a cat can leap, which is several feet; and doubtless the tiger, being ten times as long, can spring proportionably. They are also fleet in running, but seldom exert this quality, preferring to take their prey by surprise, rather than chasing.

This species is extremely scarce; of the number of its young we have no certain accounts; it is said to bring four or five at a time; the female, ever furious, then exceeds her usual rapacity. If her young be taken from her, she pursues the spoiler with incredible rage; if she overtake him, he drops one cub, with which she immediately returns to her den, and again pursues him; he drops another, and by the time she has returned with that, escapes with the remainder.

The tiger expresses its resentment much like the lion; moves the muscles and skin of its face, shews its teeth, and shrieks frightfully. Its note is very different from that of the lion, being rather a scream than a roar. The Indians sometimes eat its flesh, and find it neither disagreeable nor unwholesome.

There is an American animal, usually called the Red or Brown Tiger (by Mr. Buffon, the Cougar), which, though very different from the true tiger, yet resembles it except in colour, being equally slender, and smaller necked, than others of the panther kind.

These are common in South-America, and extremely destructive, carrying off fowls, dogs, and other domestic creatures. The Negroes and Indians are very dexterous in encountering them; and some, for a small reward and their skins, seek their retreats. Their arms in this combat are a lance of two or three yards long, of heavy wood, the point hardened in the fire; and a kind of scymitar, about three quarters of a yard in length. They wait till the tiger assaults the left-hand, which holds the lance, and is wrapped in a short cloak of baize. Sometimes the animal, aware of danger, declines the combat; but is provoked with a slight touch of the lance, which, when it feels, it grasps with one paw, and with the other strikes at the arm which holds it. At this moment the person, with his other hand, nimbly aims a blow with his scymitar, and hamstringing the creature, which immediately draws back enraged, but instantly returns to the charge, and by another stroke on the other paw, is deprived of the power of motion, and becomes an easy conquest.

These animals are common in Guiana. They formerly swam over in great numbers to the island of Cayenne, to ravage the flocks and herds, and were a terrible scourge to the infant colony; but, by degrees, were repulsed. They are found in Brazil, in Paraguay, in the country of the Amazons, and in other parts of South-America. They often climb trees in quest of prey; or to avoid their pursuers.

THE PANTHER.

THE Panther has been by many naturalists mistaken for the tiger, which it approaches in size, fierceness, and beauty; but is distinguished by being *spotted*, not streaked. The panther is to Africa, what the tiger is to Asia; with this alleviation, that it prefers the flesh of brutes to that of man; but when hungry, makes no distinction. Its manner of taking its prey is equally insidious as the tiger, by surprise, crouching in thickets, creeping on its belly till it can spring at once on its mark. Will climb up trees in pursuit of monkeys and lesser animals. The Romans exhibited this creature and the leopard in their public shews: Pompey shewed four hundred and ten; Augustus, four hundred and twenty. But they still swarm from Barbary to Guinea.

Next to the great panther, is the LEOPARD, which is often called the Leopard, or Panther of Senegal, where it is chiefly found. Their principal differences are as follow: The large panther is often six or seven feet long, from the tip of the nose to the insertion of the tail; the leopard of Senegal is not above four. The panther is marked with five or six spots, making a kind of circle, and a large one in the middle; except on the face and legs. The leopard is more beautiful, his yellow coat more brilliant, his spots smaller, not disposed in rings, but in clusters. They are both whitish under the belly; the tail of the first three feet, of the second two and a half, consequently rather longest in proportion.

The JAGUAR, or PANTHER of South-America, resembles these two, except in the disposition of its spots, and that its neck and head are rather streaked than spotted; and the creature is said to be lower on its legs. There is sometimes seen a combat between this animal and the crocodile, which is extraordinary. When the jaguar comes to drink, the crocodile, who has been long watching to surprise any animal that

approached, raises its head above the water; the jaguar instantly strikes its claws into the eyes of the crocodile (its only penetrable part), who, diving directly, pulls his enemy with him, and commonly both perish.

These three animals we may rank together, as they agree pretty nearly in their robe, their size, their dispositions, and their ferocity.

The OUNCE is at most three feet and a half long; its tail often longer than the rest of its body; its colour rather inclining to a cream colour, deeper on the back, whiter towards the belly. The hair on the back an inch and a half long; that on the belly, two inches and a half, which is much longer than that of the panther. Its spots are disposed like those of the panther; but on the haunches it has rather stripes than spots.

The ounce is remarkable for being tamed; and is employed in the East for the chase. A small kind of panther is sometimes used for this purpose; yet never thoroughly subdued, but usually brought to the field in a carriage, and kept chained and caged till shewn their prey. This they pursue by three or four great springs. If it escape from their first effort, they appear quite confounded, and sometimes are so much enraged at it, that they attack their employer, and his only resource to avoid their fury, is to throw them some small pieces of meat which he has brought with him for that purpose.

The ounce is treated with more confidence, and brought to the field hood-winked behind a horseman. When the game appears, the ounce is instantly uncovered, and shewn where it lies; on which the fierce creature darts like an arrow, and seizes it at once, or, missing it, remains motionless in the place. It runs badly, and has no scent. Scent indeed is nearly, if not totally, useless in tropical climates; for their extreme heat produces such universal putrefaction, such various and powerful odours, that dogs themselves are first bewildered, and at last deprived of the delicacy of their scent.

Among smaller animals of this kind is the CATAMOUNTAIN, or TIGER CAT of most who exhibit it. It is a Mexican animal, about two feet and a half in length, from the nose to the insertion of the tail. It is extremely like a cat, but larger and slenderer; its colours more beautiful, and its tail rather shorter. The fur is reddish, beautified with black spots, and streaks, long on the back, and round on the belly and paws. On the ears are black stripes, which run across; but, in other respects, they entirely resemble those of a cat. These colours are not permanent, but differently disposed in different specimens.

The

The Catamountain, or Tiger Cat, one of the fiercest, and, for its size, one of the most destructive animals in the world, is a native of South-America. Two of these, from which Mr. Buffon has taken his description, were brought over from Carthagera, and having been taken from the dam very young, were suckled by a bitch. But, before they were three months old, they had strength and ingratitude sufficient to kill and devour their nurse. Their succeeding fierceness and malignity seemed to correspond with their first efforts; no arts could tame or soften them; they testified an unceasing disposition for slaughter: When food was given them, the male always served himself before the female ventured to touch a bit, and not till after he was satisfied the other began. In their savage state, they are highly destructive; having great strength and agility, they easily overtake their prey, which they pursue among the tops of the trees, as well as on the ground. They suck the blood with avidity, and frequently leave the carcase untouched, to pursue other animals for their blood. They generally continue on trees, like our wild cats, where they often bring forth their young. When an animal passes beneath them, they dart down upon it with inevitable exactness.

From this tribe of the cat kind, with spotted skins and a long tail, we come to another with skins diversified in like manner, but with a shorter tail. The principal of these is the LYNX.

The first striking distinction of the lynx, from the panther kind, is its tail, which is barely half as long in proportion, and black at the extremity. Its fur is much longer, its spots less vivid, and confusedly mingled; its ears long, tipped at the points with a black tuft of hair; colour round the eyes white, the physiognomy more placid. Each hair of this animal is of three different colours: the root a greyish brown, the middle red or ash-coloured, the ends white. This whiteness makes the body appear as if silvered over; the hair in the spots has no white at the ends. This animal equals the ounce in size, but is stronger built, and it has but twenty-eight teeth; whereas all of the cat kind already mentioned have thirty.

The lynx inhabits chiefly the north of Germany, Lithuania, Muscovy, Siberia, and North-America. Those of the new continent are rather smaller than those of Europe. It exactly resembles the cat, except that, being nearly two feet long, it is bolder and fiercer. Like the cat, it climbs trees, seeks its prey by surprise, is delicate and cleanly, covering

its urine with its paws (but it resembles the wolf in cry, which often deceives the hunters). Having once feasted on its prey, will not return to it, but hunts for another : Whence may have arisen the common report of the lynx having the shortest memory of all quadrupeds.

The SYAGUSH is native of the East-Indies, and resembles the lynx in size, in form, and in being tufted at the tips of the ears ; but differs in not being mottled. Its hair is rougher and shorter, its tail longer, its muzzle more lengthened, its physiognomy more fierce, and its nature more savage. Leaps on its prey, and creeping on their necks, scratches their eyes out.

The SERVAL is native of Malabar, resembling the panther in its spots, but the lynx in the shortness of its tail, in its size, and in its strong-built form.

These seem to be the principal distinctions of this kind. From the large panther to the domestic cat, which is the smallest of all, their nature seems the same, fierce, subtle, cruel, and cowardly. The panther, the leopard, and the jaguar, as they are the largest, are also the most dangerous ; but all are rapacious in proportion to their power.

The whole race may be considered as the inveterate enemy of mankind ; others are stronger, but gentle ; more numerous, but more feeble ; and rather expect safety by concealment, than by opposition ; while these maintain their ground, and may be said to keep certain districts of the earth in their own possession.

T H E

W E A S E L K I N D

ARE distinguished by their length and slenderness of body, by which they pass through very small crevices. They bear the name of vermin from this similitude to the worm. Their claws can neither be drawn in nor extended at pleasure (as cats). They are clothed rather with fur than hair ; and have glands near the anus, opening into, or beneath it, furnishing a substance, in some the most offensive smell in nature, in others a pleasing perfume ; cruel, voracious, cowardly, thievish, and slow ; supported by their patience, assiduity, and cunning ; live long without food ; but if they meet with plenty, destroy all before they satisfy their appetite, and suck the blood, before they touch the flesh.

The

The WEASEL is in length barely seven inches, from the nose to the insertion of the tail; its height not above an inch and a half, consequently is near five times as long as high. The bushy tail, of two inches and a half, adds to the animal's apparent length. Colour pale tawny brown on the back and sides, white under the throat and belly; has whiskers like a cat, and thirty-two teeth (two more than the cat), and these better adapted for tearing and chewing than the cat's. Eyes little and black; ears short, broad, and rounded, have a fold at the lower part, which makes them seem double. Beneath the corners of the mouth, on each jaw, a brown spot.

This animal inhabits the temperate parts of Europe, scarce in the North and in Barbary; is very formidable to quadrupeds an hundred times its size. Where sheep or lambs are bred, the weasel is detested and destroyed as noxious; where agriculture is followed, is considered as a friend, being destructive to such vermin as live on corn. One of the most untameable and untractable of animals. When kept in a cage, will not touch its victuals while looked at; is continually agitated; and frightened so much at the sight of mankind, that it will die, if not permitted to hide itself in a sufficient quantity of wool or hay, whereto it may carry its food; passes three parts of the day in sleep; night its time of exercise and feeding. Is seen stealing from its hole at the approach of evening, and creeping about the farmer's yard for prey. If it enters among poultry, immediately aims at the young ones; does not eat its prey on the place, but killing it by a single bite near the head, with a wound scarcely perceivable, carries it off; is a great devourer of eggs; is remarkably active; in a confined place, scarce any animal can escape it; runs up the sides of walls with facility, and winds through a very small hole. In winter, chiefly confines itself in barns and farm-yards, till spring, where it brings forth, and makes war on rats and mice, with greater success than the cat, pursuing them into their holes. A gentleman once found eighty-five, newly killed, in one weasel's hole. Creeps also into pigeon holes, destroys the young, catches sparrows, and small birds; and, if it has young, hunts with great boldness and avidity. In summer, ventures farther from the house, to where the rat, its chief prey, precedes it; is found in low grounds, by the water-side, near mills, and often hides its young in the hollow of a tree.

The female takes every precaution to make an easy bed; lines her hole with grass, hay, leaves, and moss; brings from three to five, with closed eyes; but soon strong enough to follow their dam, and assist in

her rapine. The weasel does not run, but bounds; when it climbs a tree, gets high from the ground by a single spring; jumps on its prey; and, having an extremely limber body, evades the attempts of much stronger animals to seize it.

This animal has a very strong peculiarly foetid smell; the glands which furnish this foetid substance (which is of the consistence of suet) open directly into the anus, and taint the excrement, more strongly in summer than in winter; and when irritated or pursued, than when at ease. Always preys in silence; when struck, by a rough kind of squeaking, at once expresses resentment and pain; never loses its appetite for animal food, and seems to enjoy the vicinity of putrefaction. Mr. Buffon tells us of one found, with three young ones, in the carcass of a wolf that was putrid, and had been hung up, by the hind legs, as a terror to others.

THE

ERMINE, OR STOAT.

THE Stoat, or Ermine, usually exceeds nine inches long; the tail five inches and a half, tipped with black; edges of the ears and ends of the toes yellowish white; general colour lightish tawny brown; in winter, becomes white or cream-coloured; yet always retains the black tip of the tail. Sometimes found white in Great-Britain. Haunts woods, hedges, and meadows, by brook sides; rarely barns, &c.

The ermine is remarkable for the softness, closeness, and warmth of its fur. Mr. Daubenton had one with its winter fur, which he kept to observe its manner of moulting. He received it in the beginning of March; very shortly it began to shed its coat, and a mixture of brown variegated the white; at the ninth of the month its head was nearly a reddish brown; this colour daily extended along the neck and back, like a stripe of half an inch broad. The fore-part of the legs then assumed the same colour; part of the head, the thighs, and the tail were the latest, but all changed by the end of the month. This little animal, when confined, was very wild and untractable, ever violently agitated except when asleep, which often occupied three parts of the day. Except for its disagreeable scent, was an extremely pretty creature, its
eyes

eyes sprightly, its physiognomy pleasant, motions swift. It ate eggs or flesh, but always let them first putrify. As some of this kind are fond of honey, it was tried with such food, of which it ate, and died shortly after.

In the north of Europe and Siberia, their skins make a valuable article of commerce; are there abundant; some in Newfoundland and Canada; burrow in the fields, or in birch forests, never in those of fir or pine; are shot with blunt arrows, or taken in traps made of two flat stones; one propped with a stick, to which is fastened a baited string; when the animals attempt to pull this away, the stone drops, and crushes them,

THE FERRET

IS above one foot long, of slender body and short legs; its nose sharp; is commonly of a cream colour, but are found white, blackish, brown, and party-coloured. The whitish have red eyes, as is almost general with animals entirely of that colour. The hair on its tail is much longer than in the weasel; tail five inches.

This animal is native of the torrid zone, from whence it was fetched into Spain to free that country from rabbits, which over-run it; cannot bear our climate, without care and shelter; kept for its use in the warren; is naturally such an enemy of the rabbit, that if a dead rabbit be presented to a young ferret, though it has never seen one before, it instantly attacks it. If the rabbit be living, the ferret eagerly seizes it by the neck, winds itself round it, and sucks its blood. In warrens they enter the holes, and drive the rabbits into nets at the mouth. The ferret is always muzzled, lest it should continue at the bottom of the hole. If it disengages itself of its muzzle, instead of returning, it leads a rapacious solitary life during summer, and dies with the cold of winter; unless smoked from his hole.

The female is less than the male; they sleep almost continually; the instant they wake, seem eager for food, which is usually bread and milk; they breed twice a year, bring five, six, to nine at a litter. Some of them devour their young. The ferret is useful, but disagreeable and offensive; foetid, voracious, tame without attachment; blood-thirsty,

even to the killing children in the cradle; easily irritated, then especially its smell offensive; its bite very difficult of cure.

To the ferret kind, we may refer an animal which Mr. Buffon calls the VANSIRE, the skin of which was sent him stuffed from Madagascar; thirteen inches long; much resembling the ferret, but having twelve grinding teeth, whereas the ferret has but eight. In colour, a dark-brown throughout.

T H E P O L E C A T

IS one foot five inches long; so much resembles the ferret, that some have thought them the same; but is larger, not so slender, has a blunter nose; differs internally, having but fourteen ribs, whereas the ferret has fifteen; wants one breast bone of the ferret. Warreners assert, that they will mix, and this is promoted to improve the breed of ferrets, which, by long confinement, sometimes abates its rapacious disposition. The produce most resembles the polecat, being darker than the ferret.

The polecat is principally a deep chocolate colour; white about the mouth; ears short, rounded, and tipped with white; a little beyond the mouth a stripe begins, which runs backward, partly white, partly yellow: its hair (like that of all this class) is of two sorts; the long, and the furry; of different colours; the longest black, the shorter yellowish; the throat, feet, and tail are blackest; the claws white underneath, brown above; tail about six inches. Is very destructive to young game of all kinds; but the rabbit seems its favourite prey; a single polecat will often destroy a warren; it kills much more than it can devour. Resides in woods or thick brakes, making holes under ground of two yards deep, ending among roots of large trees for security. In winter, frequents houses, robs the hen-roost and the dairy; is particularly destructive among pigeons; dispatches each with a single wound in the head: after killing many, and satiating itself with their blood, carries them one by one to its hole; but if the opening by which it entered the dove-house be too small for the body of the pigeon to pass, contents itself with carrying away the heads, and feasts on the brains. Is fond of honey, attacks the hives in winter, and forces the bees away.

The

The female brings forth in summer, five or six at a time; these she soon trains to rapacity, supplying the want of milk (of which no carnivorous quadruped has plenty) by the blood of animals. The fur is soft and warm; but its offensive smell can never be removed or suppressed. The polecat inhabits temperate climates; is rare in the north and in warm latitudes.

THE MARTIN

IS generally eighteen inches long; the tail ten, and bushy at the end; its cry sharp and piercing; its nose flatter than the polecat; its colours more elegant; its scent not offensive, but considered as a perfume; the most beautiful of all British beasts of prey; its head small and elegant; eyes, lively; ears, broad, rounded and open; back, sides, and tail, covered with a fine thick downy fur, with longer hair intermixed; the roots ash colour, the middle bright chestnut, the points black; the head is brown, with a slight cast of red; the legs, and upper sides of the feet, chocolate colour; the palms, or under sides, covered with a thick downy fur; the feet broad; claws white, large and sharp, well adapted for the purposes of climbing, but incapable of being sheathed or unsheathed; throat and breast, white; belly of the same colour with the back, but rather paler; hair on the tail very long, especially at the end, where it appears much thicker than near the insertion.

There is a yellow-breasted martin; differs only by its yellow breast; the colour of the body is darker, and its fur more valuable, beautiful and glossy; is much more common in France than in England; yet even there is much scarcer than that with the white breast.

Of all the weasel kind, the martin is the most pleasing; its motions are graceful and agile; scarce an animal in our woods will oppose it; the wild cat itself, though much stronger, is not its match, and seldom meets it without a combat; has been kept partly tamed, in which state it ate every thing except salad or herbs; was remarkably fond of honey; drank often; often slept two days together, and often passed two or three days without sleep. Before it slept, drew itself into a round, and hid its head by its tail.

When the martin finds itself pursued by dogs (for which there is a peculiar breed) it makes to its retreat, which is generally the hollow of

some tree, toward the top, which to come at, it must be cut down. Their nest is generally the original tenement of the squirrel. It brings three or four, to six; their eyes closed. The dam compensates her deficiency of milk, by bringing them eggs (which she often carries whole) and live birds, accustoming them early to rapine. When she leads them into the woods, the birds discover and attend them, threatening and insulting her, alarming every thicket, and often directing the hunter.

The martin is more common in North-America than in Europe; but is found in all the northern parts, from Siberia to China and Canada. They are hunted for their furs, which are very valuable.

T H E S A B L E.

SABLE fur is held in the highest esteem; is brownish black; the darkest most valuable. A single skin, not above four inches broad, is often valued at 10 or 15*l*. The fur has no grain; every way equally smooth and unresisting.

The sable resembles in form the martin, and the weasel in the number of its teeth; is eighteen inches long, tail twelve; very large whiskers about the mouth; its feet broad, five claws on each foot. Some are dark brown over the body, except the ears and throat, where the hair is rather yellow; others yellowish, their ears and throat paler. These are their winter colours, which they change in spring; the former becoming a yellow brown, the latter a pale yellow; sometimes found snow-white. They resemble their kind in vivacity, agility, and inquietude; in sleeping by day and preying by night, and in their disagreeable odour. Live on smaller animals, ermines, weasels and squirrels, but especially hares; in autumn on berries; bring forth in April from three to five.

Inhabit the banks of rivers, in shady places, and the thickest woods, beneath the roots of trees, or holes in the earth; leap easily from tree to tree, and are said to fear the sun; are mostly found in Siberia, very few elsewhere; but supposed, in one of its varieties, to be found in America, where it grows large. Sable hunting is chiefly followed by condemned exiles sent from Russia into these wild and extensive forests, that, great part of the year, are covered with snow. They are obliged to shoot with only a single ball, or with cross-bow and blunt arrows, to avoid spoiling the skin.

THE ICHNEUMON.

THE ichneumon, which some have injudiciously denominated the Cat of Pharaoh, is the boldest and most useful of the weasel kind; in Egypt is used as the cat in Europe, and is more expert in catching mice. Differs in size from twenty-four to forty-two inches; resembles the martin in appearance, but the hair is of a grizzly black, much rougher and less downy; the tail is not so bushy at the end, and each hair has three or four colours, which shew in different dispositions of its body. Under its rougher hairs is a soft brownish fur; the rough hair is about two inches long, on the muzzle extremely short, as on the legs and paws. Being long since domesticated, has many varieties.

The ichneumon, to the strength of a cat, unites more instinct and agility, more universal appetite for carnage, and greater variety of powers to procure it; pursues equally rats, mice, birds, serpents, lizards, insects, every living thing which it can overcome. Its courage equals its appetite. It fears neither dog, cat, vulture, nor viper; attacks all kinds of serpents with avidity, seizes and kills them how venomous soever, even the *cobra di capello*, skilfully seizing them by the throat to avoid injury. It discovers and destroys the eggs of crocodiles, and kills the young ones ere they reach the water; generally resides on the banks of rivers, in times of inundation approaching inhabited places, in quest of prey. Advances silently and cautiously, changing its manner according to circumstances: sometimes carries its head high, shortens its body, and raises itself on its legs; sometimes lengthens itself, and creeps along the ground, or sits on its hind legs, like a dog when begging; or will feign itself dead; loves fish; darts like an arrow on its prey, and seizes it with inevitable certainty. Its eyes are sprightly and full of fire; its physiognomy sensible, its body nimble, tail long, hair rough and various. Like all of its kind, has glands that open behind, and furnish an odorous substance. Its nose is too sharp, and its mouth too small, to seize large things; easily strangles a cat, and fights with dogs; takes the water like an otter, and is said to continue under it much longer; grows fast and dies soon.

Is found plentifully in the south of Asia, from Egypt to Java; in Africa, at the Cape of Good Hope; is incapable to support the rigour of our winters.

This

This animal was formerly worshipped by the Egyptians. If we consider the number of eggs which the crocodile lays, often three or four hundred, we have reason to admire this animal's usefulness, as well as industry, in destroying them, since otherwise the crocodile might be produced in sufficient numbers to over-run the whole earth; beside which, his services in destroying the various kinds of serpents, place his utility much above that of many deities adopted among that superstitious people.

THE STINKARDS.

ALL the weasel kind have glands furnishing an odorous matter, near the anus. The substance they furnish is in some a perfume; in others, as the weasel, ermine, ferret, and polecat, is extremely offensive; but the smell of these is fragrance itself, when compared to that of the *Squash* and the *Skunk*, which are found in America, also in the south of Africa, and denominated by our sailors THE STINKARDS. The glands in these animals are much larger, and furnish a matter sublimed to a degree of putrescence truly amazing. A single grain of musk or civet will diffuse itself over a house, and continue for months; but this is nothing, either for strength or duration, to this insupportable odour. It is usually voided with their excrement; and if but a single drop happens to touch a man's garment, it is scarce possible he should wear any part of it more. This ejection of their excrement defends them against their pursuers; nor is employed, except when enraged or affrighted. They are often kept tame about houses in America, without being very offensive.

The *Squash* is about the size of a polecat, its hair a deep brown, but differs in having only four toes on the feet before, whereas all other weasels have five. The *Skunk* resembles a polecat, but differs in the length of its hair and colour. The hair is above three inches and a half long, at the end of the tail above four inches. Colour is partly black, partly white, variously disposed, very glossy, long and beautiful.

The Conepate and the Zorille seem varieties. The coneopate resembles the skunk, except in size, being smaller, and in the disposition of its colours, which are more exact, having five white stripes on a black ground, running longitudinally from the head to the tail. The zorille resembles

resembles the skunk, but is rather smaller and more beautiful; its streaks of black and white more distinct; and its tail black at its insertion, and white at the extremity; whereas in the skunk they are all grey.

The SQUASH burrows in the clefts of rocks, where it brings forth; steals into farm-yards, and kills the poultry, eating only their brains. If pursued, calls up all its scents, which reach half a mile round, and near are stifling. If pursued, endeavours to escape by getting up a tree, or by some such means; driven to extremity, lets fly on the hunters; should a drop of this foetid discharge fall in the eye, the person runs the risque of being blinded for ever. The dogs instantly abate of their ardour, turn tail, and leave the animal, rubbing their noses in the grass. In 1749, says Kalm, one came near the farm where I lived, in winter time, during the night; the dogs on the watch pursued it, until it discharged against them: though I was in bed a good way off, I thought I should have been suffocated; and the cows and oxen, by their lowings, shewed their sufferings by the stench. Another crept into our cellar, but did not exhale the smallest scent; till a foolish woman, who perceived it at night, by the shining of its eyes, killed it. That moment its stench began; the cellar was filled with it to such a degree, that the woman kept her bed several days, and all the provisions were so infected, that they were obliged to be thrown out of doors.

THE GENETTE

IS rather less than the martin; resembles the weasel kind, in its length, compared to its height, in having a soft beautiful fur, its feet armed with claws that cannot be sheathed, and its appetite for petty carnage. It differs in having the nose much smaller and longer, the tail also tapers to a point, and is much longer; its ears are larger, and its paws smaller; is spotted with black, on a ground mixed with red and grey; has two sorts of hair, one shorter and softer, the other longer and stronger, half an inch long; longer on the tail; its spots distinct and separate on the sides, unite towards the back, forming black stripes, which run longitudinally from the neck backwards; has along the back a kind of mane or longish hair, which forms a black streak from head to tail; tail marked with rings, alternately black and white, its whole length. Like all the weasel kinds, has glands; these separate a kind of perfume; open differently

from those of other animals of this kind, under the anus, so that the male seems, on superficial observation, to be of two sexes.

Belon assures us, that he has seen them in the houses at Constantinople as tame as cats, and employed in similar purposes. The species is not much diffused; is found in Spain and Turkey, and part of France; requires a warm climate; yet is not found in India or Africa.

T H E C I V E T.

THE civet is found above thirty inches long. Mr. Buffon distinguishes this species into two kinds, the civet and the zibet. The latter differs in being longer, slenderer, the nose smaller, the ears longer and broader; no mane or long hair running down the back; the tail longer and better marked with rings of different colours.

The civet resembles the weasel kind in slenderness of body, shortness of legs, the odorous matter from the glands behind, the softness of its fur, the number of its claws, and their incapacity of being sheathed. It differs in being larger, the nose lengthened, the tail long and tapering to a point, and its ears strait like those of a cat. Is commonly ash-coloured, spotted with black (the female is whiter, tending to yellow); and the spots are much larger, like those of a panther; on the belly, and under the throat, is black; the body black or streaked with grey; is sometimes streaked, as tabby cats; has whiskers; its eye is black and beautiful.

The bag, which is the receptacle of the civet, opens under the anus. There is another opening lower down, but of what use is not known. The bag is about two inches and a half broad, and two long, covered with short hair, large enough to hold a small pullet's egg. In this are small glands, furnishing a strong perfume, of the colour and consistence of pomatum.

Is bred among the Turks, Indians, and Africans; also in Holland, where they make no small gain of its perfume, being reckoned the purest. It gives in proportion as it is delicately and abundantly fed. Eats raw flesh hashed small, eggs, rice, birds, young fowls, and particularly fish. Drinks but rarely, yet urines frequently. The perfume of the civet communicates itself to all parts of the animal; the fur and the skin preserve the odour long. If a person be shut up with one of them in a close room, he cannot support the perfume. When irritated, its
scent

scent is violent; if it be made to sweat, this also is a strong perfume, and serves to adulterate or increase what is otherwise obtained from it.

The civet is said to be wild and fierce; though sometimes tamed, never familiar. Its teeth strong and cutting; its claws feeble. Light and active; it pursues birds and small animals. Their eyes shine in the night; probably they see best in the dark. They breed very fast in their native climates.

THE GLUTTON,

WHICH Linnæus places among the weasels, from the similitude of its teeth; to this agrees its length of body, its shortness of legs, the softness of its fur, its disagreeable scent, and its insatiable appetite for animal food. Mr. Pennant, however, ranks it among the bears.

Is about twenty-eight inches from nose to tail; the fore legs about one foot from the extremity of the nails to the body; the hind legs somewhat longer; the tail eight inches, including four inches of hair at the end; the muzzle black to the eye-brows; from the eye-brows to the ears, white mingled with brown; ears one inch long; front of its body spotted with white; the legs, tail, belly, and back, black; sides of a yellowish brown; interior fur or down, white; five very crooked claws, better fitted for climbing trees than for running along the ground; is found in the north of Europe and Siberia, and in North-America, where it is named the Carcajou.

In America, this voracious creature lurks among the thick branches of trees to surprise the deer. Endued with patience equal to its rapacity, singles out trees marked by the teeth or the antlers of deer, and there remains watching. When the elk or the rein-deer pass, it darts down upon them, sticks its claws between their shoulders, and there remains. In vain the frightened animal increases its speed, or threatens with its horns; drives rapidly among the thickest woods, and strikes against the largest trees. It never seizes without bringing down its prey, unless it plunges into water, which the glutton fears. The deer, feeble with loss of blood, falls, and the glutton compensates former abstinence, by present voracity. It is indeed amazing how much one of these animals can eat at a time! That seen by Mr. Klein, though in captivity, ate thirteen pounds of flesh daily, yet remained unsatisfied.

Mr. Buffon says, one he had, ate four pounds daily, but swallowed it so fast as to risque choaking. After a long fast it gorges till incapable of motion; it lies torpid two or three days by the animal it has killed, protected even from the wolf and bear by its horrid smell. Thus eating and sleeping till its prey be devoured, bones and all, then returning to its post of expectation. Seems to prefer putrid flesh; is so slow, that most quadrupeds escape it, except the beaver, which it frequently pursues on land; but the beaver generally makes good its retreat by taking to the water; often examines the traps laid for other animals; steals on the retreats of the rein-deer, whose flesh it prefers; seeks animals wounded by the hunters; pursues the isatis while hunting for itself; when that animal has run down its prey, comes in and seizes the whole; sometimes devours its provider; digs up graves, and devours the bodies.

Is a solitary animal, never seen in company except with its female in the midst of winter; goes with young about four months, and brings two or three; burrows in holes. Male and female are generally found together, and equally resolute in defence of their young. Linnæus informs us, that it is very difficult to be skinned.

OF THE

H A R E K I N D.

ANIMALS of the hare kind, like all that feed on vegetables, are inoffensive and timorous. Abundantly supplied by nature, they have not that ravenous appetite remarkable in such as are often stinted in provision.

The hare, the rabbit, and the squirrel, are placed by Pyer among those that chew the cud; nevertheless they chew their meat very much before they swallow it. They use their fore-paws like hands; are so very prolific, that were they never molested, they would quickly overrun the earth.

The HARE is the largest, the most persecuted, the most timorous; its muscles and its senses seem given only for flight; by its large prominent eyes, placed backward in the head, it can almost see behind it as it runs. These are never wholly closed; but the watchful animal sleeps with them open.

open. The ears are remarkably large, are moveable to every quarter, and readily receive the smallest sounds; the hinder feet are longer than the fore, which augments its rapidity, especially up hill.

The hare multiplies exceedingly; the females go with young thirty days; generally bring three or four. They are also fitted in an extraordinary manner for multiplying their kind; the conformation of the womb permits pregnancies of different conceptions, after one delivery retaining another: being divided, so that one side may be filled, while the other remains empty.

The young are brought forth with their eyes open; the dam suckles them twenty days, after which they leave her, but seldom separate far from their native place, but make each a form at some distance, having a predilection rather for the place than each other's society. They repose by day, feed during night, choose the tender grass, quenching their thirst with dew; eat also roots, leaves, fruits, and corn; prefer such plants as have milky juice; strip the bark of trees during winter, except the lime or the alder; are fond of birch, pinks, and parsley. In February, the male pursues the female by the sagacity of his nose. They are then seen, by moon-light, playing, skipping, and pursuing each other; but the least alarm disturbs their revels; they instantly fly, each a separate way.

In running, they easily outstrip all other animals at first; could they preserve their speed, it would be impossible to overtake them; but their first efforts exhaust their strength, and they double back to the place they were started from. Their motions are silent, the sole of their foot being furnished with hair; and they seem singular in having hair within their mouths; live seven or eight years; come to perfection in a year. It is said the females live longer than the males; are seldom heard to cry, except when seized or wounded; their voice is not sharp; are of a complying nature, and susceptible of a kind of education; easily tamed, but incapable of attachment. If taken never so young, regain their native freedom the first opportunity. They have a remarkable good ear, can sit on their hind legs, use their fore-paws as hands, and have been taught to beat the drum, to dance to music, and perform the manual exercise.

They make their form in places where the colour of the grass most resembles them; open to the south in winter, to the north in summer. The hare, when it hears the hounds at a distance, flies by impulse: Having attained some hill, and left the dogs far behind, it stops, rears

on its hinder legs, and looks back. Sometimes will start a fresh hare, and squat in the same form; sometimes will creep under the door of a sheep-cot, and hide among the sheep; will enter holes; will go up one side of the hedge, and come down the other; run a good way thereon; take to furze bushes, leap from one to another, by which the dogs are frequently misled. Young hares tread heavier, and leave a stronger scent, than the old. The more this creature treads, the heavier it treads, and leaves the stronger scent. In moist weather, they hold by the highways most, because the scent is then strongest on the grass.

When the male and female keep one spot, they suffer no strange hare to make its form in the same quarter. They live in woods and thickets, but are naturally fonder of the open country. Hunted, shot, snared by men; destroyed by dogs, birds, cats, ants, snakes, and adders; persecuted by fleas; it seldom reaches even that short term to which it is limited by nature.

Around the north-pole, they become white in winter, and run in troops of four or five hundred on the banks of the Irtysh, or the Jenisca, as white as snow. Their fur forms a considerable article in the hat manufacture. A few are entirely black.

The hares of hot countries are smaller than ours. This animal is found from the torrid zone to the polar circle. The Jews, the ancient Britons, and the Mahometans, all rejected it as unclean, and religiously abstained from its flesh; most other people, at present, consider it as agreeable. The ancient Romans so much admired it, as to call it the food of the wise.

T H E R A B B I T.

THE rabbit, though nearly resembling the hare in form and manners, is distinct in kind. In fecundity the rabbit exceeds the hare; breeds seven times in a year; brings eight young. Should this happen regularly during four years, the progeny would exceed a million. The rabbit makes a hole, where it continues great part of the day, and breeds in security; but it loves the sunny field and open pasture; seems to be a chilly animal; is continually out when without fear; often brings forth at a distance from the warren, in a hole a foot deep; suckles about a month, covering its young with moss and grass.

In the warren, always brings forth in a hole separate from the male, more intricate and more ample than ordinary; she pulls off her belly a good quantity of hair, with which she makes a bed. The two first days she does not stir out but for nourishment; suckles her young near five weeks; the male seldom visits them, but when grown up, he seems to acknowledge them as his offspring, takes them between his paws, smooths their skin, and licks their eyes, bestowing on each alternately an equal share of caresses.

When a fresh warren is stocked with tame rabbits, unaccustomed to the art of scraping a hole, they continue exposed to the weather and accidents without burrowing; and not till after two or three generations begin to find the necessity and convenience of an asylum.

Rabbits are of various colours; white, brown, black, and mouse-colour. The black are the scarcest. Most wild rabbits are brown; in every nest of rabbits, whether the parents be black or white, are some brown.

A gentleman who bred rabbits for amusement, says, "the descendants were surprisingly obedient and submissive to their common parent, who was easily distinguished by his superior whiteness; when they quarrelled among each other, he ran directly up, and all was instantly reduced to peace. If he caught any of them in the fact, he punished them. Having accustomed them to come to me with the call of a whistle, when this signal was given, I saw him marshalling them, leading them foremost, then suffering them all to file off before him." The rabbit, though less than the hare, generally lives longer. Are generally fatter than the hare, but their flesh much less delicate.

The rabbit is native of the warmer climates, and originally imported from Spain. In that country, and its islands in the Mediterranean, they once multiplied to the greatest nuisance. At first military aid was demanded to destroy them; soon after they called in the ferret from Africa, which, with much more ease and expedition, lessened the calamity. Rabbits love a warm climate; are incapable of bearing the cold of the north; in tropical climates seldom burrow.

The Syrian rabbit, like other animals of that country, is remarkable for its length of hair, which falls along the sides in wavy wreaths, in some places curled like wool; is shed yearly in large masses, the rabbit often dragging a part of its robe on the ground. No rabbits naturally in America; those carried from Europe multiply in the West-India islands in great abundance.

THE MARMOTTE

IS almost as big as a hare, corpulent and short-legged; its head resembles a hare, but its ears are much shorter; is clothed with very long hair, and shorter fur beneath, black and grey. This length of hair increases its appearance of corpulence, so that its belly seems to touch the ground. Tail tufted, well furnished with hair, carried straight with the body; five claws behind, only four before. These it uses as the squirrel does, to carry its food to its mouth; and often sits on its hinder parts to feed.

Is chiefly native of the Alps; when taken young, easily tamed, taught to dance, to wield a cudgel, and to obey the voice of its master; has an antipathy to the dog; has great strength, joined to great agility; has four large cutting teeth, which are formidable weapons of defence; is, in general, inoffensive, and, except its enmity to dogs, seems to live in friendship with every creature, unless provoked; runs much swifter up hill than down; climbs trees with great ease, and runs up the clefts of rocks, or the contiguous walls of houses, with great facility; eats indiscriminately flesh, bread, fruits, herbs, roots, pulse, and insects; is particularly fond of milk and butter; will steal into a dairy, lap the milk like a cat, purring all the while, as an expression of pleasure. Milk is the only liquor they like; seldom drink water, and refuse wine. When pleased, yelp like puppies; when irritated, have a piercing note that hurts the ear. Are very cleanly animals, but have a disagreeable scent, particularly in summer. Their flesh, being fat and firm, would be very good, were not this flavour predominant.

The marmotte, though native of the highest mountains, where the snow is never wholly melted, seems especially to feel the influence of cold, and its faculties are benumbed in winter. This extraordinary suspension of life and motion deserves our attention.

The marmotte, in September or October, prepares its habitation for winter residence, and does not quit it till April. It is a deep hole on the side of a mountain, spacious at bottom, wherein several can reside without crowding or injury. It resembles the letter Y; the two branches being two openings, which unite and terminate in their general apartment at the bottom. One branch sloping downwards, and serving as a kind of sink or drain; the other sloping upwards, serving as a door. The

apartment at the end is warmly stuccoed with moss and hay. This work is very laborious, and performed in common. Here they pass three parts of their lives; in stormy weather; while it rains, and during danger; they never stir out except in fine weather, nor ever go far from home. When abroad, one is a centinel; and when an enemy, a man, a dog, or a bird of prey, approaches, apprises its companions with a whistle. They store up no food; at the approach of the winter, they close the two entrances of their habitation with such solidity, that it is easier to dig up the earth any where else. At this time they are very fat, and some weigh above twenty pounds; they continue so long, but by degrees begin to waste, and are usually very lean by the end of winter. When this retreat is opened, the family is discovered, each rolled into a ball, and covered under the hay, apparently lifeless; they may be taken away, and even killed, without testifying any great pain. Gradual and gentle warmth revives them; but they die if too suddenly brought near the fire.

This torpor is produced by congelation of their blood, which is naturally cold (not above 10° of heat); their internal heat seldom exceeds that of the air. These animals, therefore, become torpid, when the external cold is too powerful for the small quantity of heat in their bodies, *i. e.* when the thermometer equals ten degrees above congelation. This Mr. Buffon experienced in the bat, the dormouse, and the hedgehog, and with great justice extends the analogy to the marmotte; extreme cold would kill them (if the heat of the air be above ten degrees, these animals revive). In this state, the blood scarcely moving, or only in the greater vessels, they want no nourishment to repair what it wears away; they become leaner in proportion to the slow attrition of their fluids, but not perceptibly, till after some months, having just sufficient motion in their fluids to keep off putrefaction, and just sufficient nourishment to supply the waste of their languid circulation, they continue rather feebly alive than sleeping.

These animals produce once a year; bring three or four; they grow very fast; live nine or ten years; are chiefly found in the Alps, where they prefer the brow of the highest mountains, and the sunny side. The inhabitants, when they observe the hole, generally stay till winter before they open it; for if they begin too soon, the animal wakes, and, having a surprising faculty of digging, makes its hole deeper in proportion as they follow.

This animal is found in Poland under the name Bobak, entirely resembling that of the Alps, except that the latter has a toe more upon its fore-foot than the former; also in Siberia under the name of the Jevraska, but rather smaller. In Canada it is called the Monax, differing in having a blueish snout, and a longer tail.

T H E A G O U T I

IS abundant in South-America, and has by some been called a rabbit, which it resembles in size and head, but its ears are short; also in the arched form of its back, in the hind legs being longer than the fore, and in having four great cutting teeth, two above and two below; but differs in that its hair is hard and bristly like that of a sucking pig, of a reddish brown colour; also its tail is shorter than the rabbit's, and without hair; and in the number of its toes, having but three on the hinder-feet, whereas the rabbit has five. With the hair of a hog, it has its voraciousness; when satiated, hides the remainder for a future occasion; gnaws every thing it comes near. When irritated, its hair stands erect along the back, and, like the rabbit, it strikes the ground violently with its hind-feet. It burrows in the hollows of trees; eats roots, potatoes, yams, and fallen fruits in autumn; uses its fore-paws to carry its food to its mouth; and its hind being longer than the fore, runs very swiftly up hill. Its sight and hearing are good; when whistled to, it stops to hearken. The French dress it like a sucking pig; the English with a pudding in its belly, like a hare. It is hunted by dogs; in a sugar ground, where the canes cover the place, it is easily overtaken; in the open country, it runs with great swiftness to its retreat, and nothing but smoke can force it out. When forced by the dogs, it turns on the hunters, and with its hair bristling like a hog, and standing upon its hind feet, defends itself very obstinately. Sometimes it bites the legs of those that attempt to take it, and will take out the piece where it fixes.

Its cry, when disturbed, resembles that of a sucking pig; taken young, is easily tamed; plays harmlessly about the house, and goes out and returns of its own accord; when wild, continues in the woods; the female generally chooses the most obscure parts to bring forth; prepares
a bed

a bed of leaves and dry grass, and generally brings two ; breeds twice or thrice a year, and carries her young from one place to another in the manner of a cat ; lodges them when three days old in the hollow of a tree, suckling them but a very short time ; they quickly come to perfection, and probably are not long lived.

THE PACA

IS about the size of a hare, or larger ; somewhat resembles a sucking pig in its grunting and its manner of eating ; is covered with coarse hair, but beautifully marked along the sides with small ash-coloured spots, upon an amber-coloured ground ; is rather more thick and corpulent than the agouti ; its nose shorter, and its hind feet have five toes ; the ears are naked, and somewhat sharp ; the lower jaw somewhat longer than the upper ; the teeth, the shape, and size of the head, are like those of the rabbit ; has a short tail, not tufted, and its hinder legs longer than the fore ; burrows like a rabbit ; does not use its fore-paws to carry food to its mouth, but hunts for it on the ground, and roots like a hog ; frequents the banks of rivers in the moist and warm countries of South-America ; is very fat ; is eaten, skin and all, like a young pig, as a great delicacy ; defends itself to the last extremity, and is seldom taken alive. Not only man, but every beast and bird of prey watches its motions ; but though its race is thus continually destroyed, it finds refuge, and breeds in great numbers.

The *TAPETI*, or Brasilian rabbit, resembles our English ones, but is much less ; is reddish on the forehead, and a little whitish under the throat ; has no tail ; has long ears, with whiskers, like our rabbits, and black eyes ; does not burrow.

The *APEREA*, called by some the Brasilian rabbit, seems to partake of the nature of a rabbit and a rat. The ears are like those of a rat, short and round ; the other parts like a rabbit, except that it has but three toes on the hinder-legs.

THE GUINEA - PIG

HAS been so long rendered domestic, that it is now become common in every part of the world; is less than a rabbit; its legs shorter, scarce seen, except when it moves; and the neck also is short; ears short, thin, and transparent; has no tail; in moving its body, lengthens like a rabbit; when at rest, it gathers up in the same manner; has the rabbit lip, but its nostrils much farther asunder; some are white, some are red, others red and white; has four toes on the feet before, and but three on those behind; strokes its head with the fore-feet like the rabbit; and, like it, sits upon the hind-feet; for which purpose has a naked callous skin on the back of the legs and feet.

These animals are perfectly helpless, scarce possessed of courage to defend themselves against a mouse, but will often fight each other very obstinately; are devoured by cats, without resistance; the female sees her young destroyed without attempting to protect them. Eat bran, parsley, cabbage, and most cultivated vegetables. The carrot-top is a peculiar dainty, and salad. They drink by lapping; are fond of new milk; but contented with water. When confined in a room, seldom cross the floor, but generally keep along the wall; the male usually driving the female before him; the following treading in the footsteps of the preceding. Seek the darkest retreats, where they sleep together, and venture out with caution; stop at the entrance, listen, look round; if they suspect danger, run back. In very cold weather, run about to keep themselves warm.

If the young ones fall into the dirt, the female takes an aversion to them; her employment seems to consist in smoothing their skins, in disposing their hair, and improving its gloss. The male and female take this office by turns; when they have brushed up each other, they attend to their young, taking care to make their hair lie smooth, and biting them if refractory.

When asleep, they lie flat on their bellies; love to have their fore-feet higher than their hinder; turn themselves round several times before they lie down; sleep with their eyes half open. The male and female never sleep at one time; while he enjoys his repose, she guards him, her head turned toward the place where he lies. When she supposes he has had his turn, she awakes him with a kind of murmuring noise, goes to him,

him, forces him from his bed, and lies down in his place. He does the same good office for her, and continues watchful till she awakes.

Goes with young five weeks; brings from three to five; becomes again pregnant immediately, so that their multiplication is astonishing; suckles about twelve or fifteen days; does not seem to know her own, but suffers the young of others to drain her, to the disadvantage of her own offspring; are produced with the eyes open, and in about twelve hours equal the dam in agility; she has but two teats, yet plenty of milk; they feed on vegetables very early; they contend for the most agreeable food, or the warmest place, very obstinately. Their manner of eating is something like the rabbit; they appear also to chew the cud; they seldom drink, yet make water every minute; they grunt somewhat like a young pig; and express pain by a more piercing note; their flesh is indifferent food.

THE SQUIRREL.

FEW wild animals have so many varieties as the squirrel. The *common squirrel* is of a reddish brown; belly and breast are white; ears beautifully ornamented with long tufts of hair, of a deeper colour than the body; eyes large, black and lively; legs are short and muscular, like those of the rabbit; the toes longer, and claws sharper, fit for climbing. When eating, or dressing itself, sits erect, like the hare or rabbit, using its fore-legs as hands; chiefly resides in trees.

The *grey Virginian squirrel* is larger than a rabbit; greyish body and limbs thicker than the common squirrel; ears shorter, without tufts; upper part of the body, and external part of the legs, a fine whitish grey, with a beautiful red streak on each side lengthways; tail covered with very long grey hair, variegated with black and white towards the extremity; seems to be common to both continents; in Sweden changes colour in winter.

The *Barbary squirrel* is a mixed colour, between red and black. Along the sides are white and brown lines, very beautiful; the belly a sky blue, surrounded with white. Some of these hold the tail erect; others throw it forward over their body.

The *Siberian white squirrel* in size equals a common squirrel. The *Carolina black squirrel* is much bigger, sometimes tipped with white at all

the extremities. The *Brazilian squirrel* is a beautiful animal, remarkable for its variety of colours; belly bright yellow; head and body variegated with white, black, brown and orange colour; wants the tufts at the ears; does not climb trees, as most of the kind do. The *little ground squirrel of Carolina* is reddish, with blackish stripes on each side; also not delighting in trees. The *squirrel of New Spain* is of a deep iron-grey, with seven longitudinal whitish streaks along the sides of the male, and five along those of the female.

This animal is diffused over all parts of the world, yet few animals are so tender. Those of the tropical climates will only live near a warm sun; while the Siberian squirrel scarce endures our temperature; some live on the tops of trees, others feed, like rabbits, on vegetables below.

The squirrel is neither carnivorous nor hurtful; eat fruits, nuts and acorns; is cleanly, nimble, active, and industrious; its eyes sparkling; its physiognomy lively; generally sits on its hinder-legs, and uses the fore-paws as hands; these have five toes, one of them separated from the rest like a thumb; nestles among the large branches of a great tree, where they fork off into small ones; begins by making a kind of level between the forks, bringing moss, twigs, and dry leaves, binds them together with great art, so as to resist the most violent storm. This is covered on all sides, except a single opening at top, just large enough to admit the little animal, which is itself defended by a kind of conical canopy, to throw off rain. The nest is very commodious below; soft, well united, convenient and warm; and shelters its inhabitant from the heat of the sun, which it seems to fear, and from the inclemency of winter, which it is less capable of supporting. Its stores are seldom in its nest, but in the hollows of the tree, and never touched but by necessity. They bring about four or five young once a year in May. Their time of gestation is about six weeks.

Seldom descends to the ground, but jumps from branch to branch; if alarmed, travels thus throughout the forest. It moves by bounds from one tree to another, at forty feet distance; if obliged to descend, runs up the next tree with amazing facility; has an extremely sharp piercing note, expressive of pain, another not totally unlike the purring of a cat when pleased; feeds in spring on buds and young shoots; in summer on fruits, particularly the young cones of the pine-tree; in autumn, on the acorn, philberd, chefnut, and the wilding; gathers now its provisions for winter, and foresees the season of scarcity.

Great Flying Squirrel.

In Lapland and the north, squirrels remove by thousands from one country to another, travelling directly forward, neither rocks, forests, nor waters can stop them. We are told by Klein and Linnæus, that on approaching a breadth of water, they return into the neighbouring forest, each in quest of a piece of bark, which as a boat may waft him over; then boldly committing their little fleet to the waves, each sits on its own piece of bark, fanning the air with its tail to drive it forwards. In this orderly manner they often cross lakes several miles broad; often too the poor mariners are not aware of the dangers of their navigation, for if the edge of the water be calm, the middle is more turbulent. There the slightest additional gust of wind oversets the little sailor and his vessel, ruins the whole navy, and shipwrecks two or three thousand sail, to the great joy of the Laplander on shore, who gathers up the dead bodies thrown in by the waves, eats the flesh, and sells the skins.

The squirrel is easily tamed, and becomes very familiar; loves to lie warm, and will often creep into a pocket or the bosom.

THE FLYING SQUIRREL

IS less than a common squirrel, its skin very soft, elegantly adorned with dark and light-grey fur; has large prominent black and very sparkling eyes, small ears, and very sharp teeth. When not leaping, its tail lies close to its back; but when springing, is moved from side to side.

It is amazing to see it at one bound dart many yards, from one tree to another, in which they are assisted by a peculiar formation of the skin, extending from the fore-feet to the hinder; when the animal stretches its fore-legs forward and its hind-legs backward, this skin is spread out between them, somewhat like that between the legs of a bat; by this increase of surface, the little animal floats in the air till the force of its first impulse ceases, then gradually descends. This skin, when at rest, is wrinkled up on the sides; when the limbs are extended, forms a kind of web between them of above an inch broad on either side. Though thus fitted for leaping, seldom exerts its powers; is easily tamed, but apt to break away; not fond of nuts or almonds, like other squirrels, but chiefly pleased with the sprouts of birch and cones of the pine.

OF THE

R A T K I N D.

OF these the most mischievous is the Great Rat, a new comer, but has taken too secure possession to be removed; sometimes called the Rat of Norway, but is unknown beyond the Baltic; probably came from the East-Indies.

This animal is in length about nine inches; its eyes large and black; colour of the head, and the whole upper part of the body, a light brown, mixed with tawny and ash colour; the end of the nose, the throat and belly, are a dirty white, inclining to grey; the feet and legs almost bare, of a dirty pale flesh colour; the tail as long as the body, covered with minute dusky scales, mixed with a few hairs. It is chiefly in the colour that this animal differs from the Black Rat, or the Common Rat, as it was once called; but now common no longer. This new invader, in a few years after its arrival, destroyed almost the whole species: the frog also, which had been introduced in Ireland, has been extirpated by it.

It burrows in the banks of rivers, ponds, and ditches, and does great damage to mounds raised to conduct streams, or confine rivers; molests farm-houses; burrows in corn, eats much, and damages more; nothing eatable escapes its voracity. It destroys rabbits, poultry, and game; swims with great ease, and thins the fish-pond.

Produces from fifteen to twenty, three times a year; happily for us, eat each other. The large male rat generally keeps in a hole by itself, dreaded by its own species, as the most formidable enemy. Dogs and cats, but not without exception, destroy them, but the weasel most effectually.

The Black Rat is in length about seven inches; the tail, near eight; colour, a deep iron-grey, almost black, except the belly, which is of a dirty cinereous hue. Over-run America, being introduced from Europe, and are now noxious there.

The Black Water-Rat is about the same size, has a larger head, a blunter nose, less eyes, shorter ears, and the tip of its tail a little white. Never frequents houses; but the banks of rivers, ditches, and ponds, where it burrows; feeds on fish, frogs, and insects; and, in some countries, is eaten on fast-days.

THE

THE MOUSE.

TIMID, cautious, and active, fearful by nature, familiar from necessity, it attends on mankind an unbidden guest; it never leaves its hole but to seek provision, and seldom ventures above a few paces; does not leave a house unless forced. The most feeble of quadrupeds, except the guinea-pig; never, though tamed, familiar; and, though fed in a cage, suspicious. Surrounded by enemies, the owl, the cat, the snake, the hawk, the weasel, and the rat, it only subsists by its amazing fecundity.

The mouse brings forth several times in the year from six to ten; these, in a fortnight shift for themselves; are seldom found in ricks or corn much infested with rats; generally choose that side of the rick from whence most rain is expected; and thence venture forth to drink the little drops of rain or dew at the extremities of the straw; seldom live above two or three years; found almost throughout the ancient continent, and exported to the new; afraid of human society, yet closely attending it; enemies to man, but only found where he has fixed his habitation.

The *long-tailed field-mouse* is larger than the former; in colour, nearly resembling the Norway rat; chiefly found in fields and gardens. The *short-tailed field-mouse*, about six inches long, has a tail not above an inch and a half long, ending in a small tuft. Its colour inclines to that of the domestic mouse. This, and the former, remarkable for laying up provision against winter, sometimes above a bushel.

The *shrew-mouse* is about the size of the domestic mouse, but differs greatly in the form of its nose, which is very long and slender. The teeth also are singular in form, and twenty-eight in number; whereas the number of the rat kind is but sixteen. The two upper fore-teeth are very sharp, and on each side is a kind of wing or beard, like an arrow, scarcely visible, but on close inspection. The other teeth placed close together, are very small, and seemingly scarcely separated. As it lives chiefly in the fields, and feeds more on insects than corn, it may be considered rather as a friend than an enemy. It has a strong disagreeable smell; is said to bring four or five young at a time.

THE DORMOUSE

MAY be distinguished into three kinds; the *greater*, the *middle*, and the *less*; the largest being equal to a rat, the least no bigger than a mouse. They differ from the rat in having the tail tufted with hair, round, resembling a brush. All have black sparkling eyes, and whiskers, partly white and partly black; are stupified like the marmotte during winter, and hoard provisions in case of revival by a sunny day.

They inhabit woods or very thick hedges, nestling in the hollow of some tree, or near the bottom of a close shrub; form magazines of nuts, beans, or acorns, and shut themselves up with it for the winter, rolling themselves up in a ball. Their nests are lined with moss, grass, and dead leaves; usually bring forth three or four young in spring.

THE MUSK RAT.

OF these are three distinctions: the Ondatra, the Desman, and the Pilori. The ondatra is native of Canada, the desman of Lapland, the pilori of the West-India islands. The ondatra differs in having the tail flattened and carried edge-ways. The desman has a long extended snout like the shrew-mouse; the pilori a short tail, as thick at one end as the other. They resemble each other in being fond of the water, and in that musky odour from whence they are named.

The ondatra is the most remarkable; about the size of a small rabbit; has the hair, the colour, and tail of a rat, but flattened on the sides; can contract and enlarge its body at pleasure. It has a muscle like that of horses, by which they move their hides, lying immediately under the skin, so powerfully contractile, and such an elasticity in the false ribs, that it can creep into an hole where others, seemingly much less, cannot follow. The female is remarkable also for two distinct apertures. Their musky smell is much strongest at one season of the year; and the marks of the sex seem to appear and disappear in the same manner.

The ondatra somewhat resembles the beaver in nature; lives in society during winter; forms houses of two feet and a half wide, in which
reside

reside several families to shelter themselves from the season; but they do not lay up magazines of provision. They form a kind of covert way to and round their dwelling, from whence they issue to procure water and roots, upon which they subsist. During winter their houses are eight or ten feet deep in snow. During summer they separate two by two, and feed on roots and vegetables. They then become extremely fat, and are sought after, as well for their flesh as their skins.

THE HAMSTER

Greatly resembles the water-rat in size, small eyes, and the shortness of its tail; is rather browner, the belly and legs a dirty yellow; is distinguished by two pouches on each side its jaw, under the skin, into which it crams provision, which it carries home for winter store. These are oblong, the size of a large walnut. They open into the mouth.

Its hole is generally on an inclining ground, always has two entrances, one perpendicular, the other oblique; (if there be many in a family, there are so many perpendicular holes.) The perpendicular hole is the door. Within about a foot of this are two more, containing provisions. There is another apartment warmly lined with grass and straw, where the female brings forth. These communicate with each other, and all together take up a space of ten or twelve feet in diameter. These animals store up dry corn well cleaned, or in the ear, beans and peas in the pod. They begin to store in August; as each magazine is filled, they carefully cover it with earth, so neatly, that it is not easy to discover where the earth has been moved; their retreats are found by observing the oblique entrance, which generally has a small quantity of earth before it; and this, though often several yards from their home, conducts the skilful to the discovery. Many German peasants make a livelihood by these hoards, which, in a fruitful season, often furnish two bushels of good grain each.

They produce twice or thrice a year, and bring five or six. In moist seasons, their devastations produce a famine. Like the rest of their kind, destroy each other. Their fur is valuable; the natives are invited by rewards to destroy them, and the weasel kind second their efforts.

T H E L E M I N G

IS a native of Scandinavia, larger than a dormouse, with a bushy tail, half an inch long; covered with thin hair; the upper part of the head, the neck and shoulders, black; the rest of the body reddish, with small black spots to the tail; eyes little and black; ears round, inclining toward the back; the legs before short, those behind longer, which renders it very swift.

In wet seasons, all the rat kind multiply; but this species so remarkably, that the Laplanders believe they drop from the clouds; they quit their native mountains in troops of millions, moving by night, in a square often more than a mile broad, covering the ground, the hindmost touching its leader. They generally move in lines, about three feet apart, and parallel, from north-west to south-east. They go *forward*, directed by some strange impulse. If extensive water interrupt their progress, they swim over it; if a fire, or a deep well, they plunge into the flames, or leap down the well; if a boat across a river, while they are swimming, they mount directly up its sides; if a stack of hay or corn, they gnaw their way through it; if a house through which they cannot get, they continue there till they die. Happily they eat nothing stored for human subsistence; but consume roots and vegetables. If they pass through a meadow, they destroy it quickly, and give it an appearance of being burnt up and strewed with ashes. If a man should venture to interrupt one of them in its course, the little animal furiously flies up at its opponent, barking somewhat like a puppy, and, wherever it fastens, does not easily quit the hold. If the leader be forced out of its line, which is very rare, it expresses its grief by a plaintive cry, and is said not to survive it. Even their breeding does not hinder their march; for some have been observed to carry one young in their mouth, another on their back. Their rapacity, at last, impels them to devour each other. After committing incredible devastations, they separate into two armies, along the coasts of the larger lakes and rivers. The Laplanders, who observe them thus drawn up to fight, consider their combats as presages of war, and expect invasion from Russia or Sweden, as the sides next those kingdoms happen to conquer. They fight till one party overcomes, and from that time disappear, most probably being entirely devoured, either in rage, or as food. Often
they

The Mole

they are found dead by thousands, and taint the air for miles, producing malignant disorders. They seem also to infect the plants they have gnawed, for cattle often die that afterward feed where they passed.

To the Swedes and Norwegians, who live by husbandry, such an invasion is terrible; but the Laplanders are happy when visited by an army of lemmings; they feast on their flesh, though horrid food even to dogs and cats, and always expect plenty of game the year following, among those fields which the lemmings have destroyed.

THE MOLE.

THE mole is formed to live wholly under the earth, that no place should be left untenanted. Is fat, sleek, and glossy, and, though denied many advantages of other animals, enjoys some of which they are but scantily possessed.

Less than a rat and bigger than a mouse, with a coat of fine, short, glossy, black hair; its nose, long and pointed; its eyes scarce possible to be discerned. Instead of ears, has only holes. Its neck short; body thick and round; small short tail; legs also very short; as it rests on its belly, the feet appear growing out of its body. The ancients, and some moderns, thought the animal utterly blind; but Derham, by a microscope, discovered all the parts of an eye. The fore-legs are very short and strong, furnished with five claws each, turned outwards and backwards, the hind-legs are longer and weaker than the fore; the teeth are like those of a shrew mouse, five on each side the upper jaw, which stand out; those behind, divided into points. The tongue is as large as the mouth will hold.

By the breadth, strength, and shortness of the fore-feet, which incline outwards, throws back the earth with ease; had they been longer, the falling in of the earth would have prevented the quick repetition of their strokes, and they would have required a larger hole for their exertion. The fore-part of the body being thick and very muscular, gives great strength to the action of the fore-feet, enabling it to dig its way with amazing force and rapidity.

Little vision is sufficient for a creature who lives in darkness; had the organ been larger, it would have been perpetually liable to injury by

falling earth; that inconvenience is avoided by its being very small, and very closely covered with hair. Anatomists mention also a certain muscle, by which the animal can advance or draw back its eyes at pleasure.

Perfectly fitted to the animal's situation, are also the senses of hearing and smelling; by the first it receives notice of distant danger, by the other, is directed, in the midst of darkness, to its food. Buried in the earth, it seldom stirs out, unless forced by violent rains, or when in pursuit of prey it gets into the open air, which is hardly its natural element: it chooses the looser softer grounds, beneath which it can travel with greater ease; where also it finds most worms and insects, on which it chiefly preys. It is most active, and casts up most earth, immediately before rain; and, in winter, before a thaw: at those times worms and insects being in motion, and approaching the surface. In dry weather, the mole seldom forms hillocks, but penetrates deeper after its prey.

Their greatest calamity is an inundation; notwithstanding every effort to reach the higher grounds, many perish, as well as their young, which remain in their holes. Without such accidents, their great fecundity would render them extremely troublesome; and as it is, in some places they are considered by the farmer as his greatest pest. They couple toward the approach of spring, and their young are found about the beginning of May, four or five at a time. It is easy to distinguish that mole-hill in which the female has brought forth, by its size. To form this retreat, she begins by erecting the earth into a tolerably spacious apartment, supported by partitions, to prevent the roof from falling; she beats the earth very firm, to render it tight against the most violent rain, and raises it above slight inundations. She then procures grass and dry leaves, as a bed for her young. All around this hill, are holes diverging into the earth, from the middle apartment, extending about fifteen feet in every direction, into which the animal makes her subterraneous excursions, and by which, as she is very quick of hearing, the instant she perceives her habitation attacked, she and her young always make good a retreat, unless the earth be dug away by several men at once.

The mole is scarcely found, except in cultivated countries: its varieties are but few. That of Virginia resembles the common mole, except in colour, which is black, mixed with a deep purple. There are sometimes white moles, particularly in Poland, rather larger than the former.

O F T H E

PRICKLY, OR HEDGE-HOG KIND.

THE Hedge-hog, apparently formidable, is yet harmless. Armed with a thousand points, for defence, not invasion. Destitute of force, cunning, or swiftness, this animal finds protection by one expedient. When attacked, it rolls itself up, and presents nothing but a ball of defensive thorns to the enemy.

This animal is of two kinds; one with a nose like a hog, the other, more short and blunt. The latter is most common; is about six inches from the tip of the nose to the tail. The tail is little more than an inch long, concealed by the spines; the head, back, and sides, covered with prickles; the nose, breast, and belly, with fine soft hair; legs short, of a dusky colour, almost bare; five toes on each foot, long and separated; the prickles are about an inch in length, very sharp pointed; their lower part white, middle black, and points white: the eyes are small, and placed high in the head; the ears are round, pretty large, and naked; the mouth is small, well furnished with teeth for chewing its food.

On occasions of danger, it alters its whole appearance; bends its back, lays its head on its breast, shuts its eyes, rolls down the skin of its sides toward the legs, draws these up, and tucks them in on every side, by drawing the skin close; resembles now not an animal, but a roundish mass of prickles, not unlike a chestnut in the husk; having, on one side, a kind of flat, where the head and legs are tucked in. Thus rolled up, it waits till its enemy is fatigued by fruitless attacks. The cat, the weasel, the ferret, the martin, quickly decline the combat; the dog himself seldom succeeds. If its assailant attempt to bite, he more frequently feels than inflicts a wound; enraged and barking, he rolls it along with his paws; but the hedge-hog patiently submits, in security, to every indignity, and, to disgust its enemy, sheds its urine. The fox, by pressing it with its weight, often obliges the hedge-hog to put out its nose, which he instantly seizes, and soon becomes master of the whole body: when danger is past, the hedge-hog peeps out from its ball, and creeps slowly to its retreat.

The hedge-hog sleeps by day, and ventures out by night; resides in small thickets or hedges; makes a hole six or eight inches deep, lies
well

well wrapped up in moss, grass, or leaves; eats roots, fruits, worms, and insects.

Mr. Buffon accuses them of tricks, not a little mischievous. "I have often," says he, "had the female and her young brought me about the beginning of June; from three to five in number; white in the beginning, and shewing only the marks of their spines; willing to rear some of them, I put the dam and her young in a tub, with abundant provision; but the old animal, instead of suckling her young, devoured them all, one after another. On another occasion, a hedge-hog, that had made its way into the kitchen, discovered a little pot, in which was meat prepared for boiling; the mischievous animal drew out the meat, and left its excrements in the stead. In the garden they did very little damage, and it was scarcely perceivable that they were there: they lived on fruits that fell from the trees; they dug the earth into shallow holes; eat caterpillars, beetles, and worms; were also very fond of flesh, boiled or raw."

They sleep during winter; at no time eat much, and can remain very long without food. Their blood is cold, like all other torpid animals.

THE

TANREC AND TENDRAC,

ARE two little animals, described by Mr. Buffon, of the hedge-hog kind, yet different; like the hedge-hog, covered with prickles, but mixed with more hair; unlike that animal, they do not defend themselves by rolling up in a ball. Found only in the East-Indies, where the hedge-hog exists also.

The TANREC is about the size of a mole; the TENDRAC still less, defended only with prickles on the head, neck, and shoulders; being elsewhere covered with a coarse hair, resembling hog's bristles. Having very short legs, they move slowly; grunt like a hog, and wallow in the mire. Are chiefly in creeks and harbours of salt water; multiply greatly; make holes in the ground, and sleep for several months. During this torpid state, their hairs, perhaps also their prickles, fall, and are renewed on their revival; are usually very fat; their flesh insipid, soft, and stringy, yet the Indians consider it as a delicacy.

THE

The Porcupine

T H E P O R C U P I N E

IS about two feet long, and fifteen inches high; covered with quills, from ten to fourteen inches long, resembling a goose-quill in thickness, but tapering and sharp, thickest in the middle, and inserted like feathers into birds; within spongy, like the top of a goose-quill; white and black alternately from end to end; some fifteen inches long, and a quarter of an inch in diameter; harder than common quills, difficult to be cut, and solid at the point: others long, flexible, and slender, grow here and there among the former; some near the tail are white and transparent. These quills incline backward, like the bristles of a hog; when the animal is irritated, they stand upright, like bristles.

The muzzle somewhat resembles a hare, but is black; the legs very short, each foot has five toes; the belly, head, and body, are covered with short hair, like prickles, except the ears and the sole of the foot; the ears are thinly covered with very fine hair, in shape are like the human; the eyes small, only one-third of an inch in length. When skinned, there appear a kind of paps where the large quills grew, the size of a small pea, answering to as many holes on the surface of the skin, which are about half an inch deep, wherein the quills are fixed. This formidable armour is entirely defensive; the quills never quit the skin, except when the animal moults them, as birds do their feathers. Their usual manner of defence is to lie on one side, and when the enemy approaches very near, by suddenly rising, to wound him with the points on the other, always directing their quills to the enemy: thus amply protected, even the lion fears to attack the porcupine. Hunts serpents and reptiles. Travellers assure us that, between the serpent and the porcupine, exists irreconcilable enmity, and that they never meet without mortal engagement. The porcupine is said to roll itself on the serpent.

Those brought to this country are usually fed on bread, milk, fruits, and meat. The porcupine is extremely hurtful to gardens, and does incredible damage. Lives from twelve to fifteen years; couples in September; the males become very fierce, and often destroy each other with their teeth. The female goes with young seven months, brings forth one, suckles it about a month, accustoms it betimes to vegetables and the bark of trees; she is very fierce in its defence; at other seasons,

is fearful, timid, and harmless. The porcupine never bites or injures its pursuers: if hunted by a dog or a wolf, climbs a tree, and continues there till it has wearied out the patience of its adversary. The Indians eagerly pursue it to make embroidery of its quills, and to eat its flesh.

The porcupines of America differ from that of the ancient continent, and may be considered as different species. These are principally,

The **COVANDO**, much less than the porcupine; its quills about a quarter the length of the porcupine's; its snout little like a hare; its tail is long, catches the branches of trees, and holds by them; may be easily tamed; inhabits chiefly the southern parts of America, yet is not wanting in the northern.

The **URSON** is native of Hudson's Bay. The body of this animal somewhat resembles a pig; is covered with long bristly hair, with a shorter hair underneath; under this the quills lie concealed very thick; they are white, with a brown point, and bearded, and the longest do not exceed four inches; they stick to the hand when the animal is stroked on the back, sometimes so fast as to follow it. They nestle under the roots of great trees, sleep very much, chiefly feed on the bark of the juniper. In winter, the snow serves them for drink; in summer, they lap water like a dog; are very common in the country lying east of Hudson's Bay; and several of the trading Americans depend on them for food, at some seasons of the year.

OF THE

M O N K E Y K I N D.

ANIMALS of this class have hands instead of paws; ears, eyes, eye-lids, lips, and breasts like mankind; their internal conformation bears partial likeness; in some nearer, in others more distant. May be divided into three classes, *viz.*

The Ape kind; these exhibit strongly the human likeness; walk upright, want a tail, have fleshy posteriors, calves to their legs, and feet somewhat like ours.

The

The Baboon kind is a more distant approach to the human form, the quadruped mixing in every part: go on all fours; when upright, some are as tall as a man, have short tails, long snouts, and are brutally fierce.

The Monkey kind are removed further, are much less, tails as long or longer than their bodies; flattish faces.

A P E S.

THE Ouran Outang, of all animals, nearest approaches the human race; is of different sizes, from three to seven feet high. In general, is less than a man; but its strength and agility much greater. Travellers, who have seen them in their native solitudes, give surprising relations of their force, swiftness, address, and ferocity. Naturalists at home have been equally struck with their patient, pliant, imitative dispositions; their appearance and conformation. That observed by Dr. Tyson is best known, having been described with the greatest exactness. It was brought from Angola in Africa; the body was covered with coal black hair, resembling human, and longest where it is longest on the human species. The face was like that of a man, the forehead larger, the head round; the jaws were not prominent, as in monkeys, but flat; the ears were like human in most respects; and the teeth, as also the bending of the arms and legs.

The differences were the flatness of the nose, the lowness of the forehead, the want of chin; the ears were too large, the eyes too close, the nose and mouth too distant, the thighs too short, the arms too long, the thumb too little, and the palm of the hand too narrow. The feet were more like hands than feet, and the animal bent too much on its haunches. It differed in the number of its ribs, having thirteen; whereas, in man, are but twelve. The tongue, and the organs of voice, were the same, yet the animal was dumb; the brain was the same, yet he wanted reason.—Professor Camper has since observed a slit in the gullet of this animal, through which the air, necessary to form a voice, escapes in a whistle.

This animal was very hairy behind; but before, the hair was much thinner, the skin appeared, and in some places was almost bare. When on all fours, it appeared all hairy; when erect, it appeared less hairy. The face, hands, and soles of the feet, were without hair, and most of the forehead; down the sides of the face the hair was thick, an inch and a half long. The palms of the hands were as long as the soles of the

feet; the toes as long as the fingers; the middle toe longest. The animal often used his hinder feet as hands; sometimes its hands instead of feet.

In its passage to England, those it knew on ship-board, it would embrace with great tenderness, opening their bosoms, and clasping its hands about them. Monkeys of a lower species it held in aversion; always avoided the place where they were kept in the same vessel. After it was a little used to wear clothes, it grew very fond of them; part it would put on without help; the rest it would carry in its hands to some of the company, for their assistance. It would lie in a bed, place its head on the pillow, and pull the clothes upwards, as a man would do.

Mr. Buffon describes one, which, says he, I have seen give its hand to show the company to the door, sit at table, unfold its napkin, wipe its lips, use the spoon and the fork to carry the victuals to its mouth, pour out its drink into a glass, touch glasses when invited, take a cup and saucer and lay them on the table, put in sugar, pour out its tea, leave it to cool before drinking, and this often of its own accord.

However, many of these extraordinary habits were probably the result of education. It is very supposable the most perfect of this kind are generally prone like quadrupeds, for when we examine the palms of their hands, and the soles of their feet, we find both equally callous and beaten; a proof that both have been equally used. It is even said, that when they are taken, their hands are tied behind them, to teach them to walk upright; and, thus educated, an ape, or a quadruped, may be an admirable object for human curiosity, but little advanced in regard to its own felicity; its conveniencies for its manner of life are neither improved nor augmented: all its acquisitions are useless to itself, and calculated to cause wonder in spectators, not to rank their possessor a single step higher in the scale of being.

Pyrard relates, that in Sierra Leona, in Africa, are a kind of apes, called Baris, strong and muscular, which walk upright, pound at a mortar, go to the river to fetch water, in a little pitcher, on their heads; but if care be not taken to receive the pitcher at their return, let it fall, and then, seeing it broken, cry for their loss.

The gigantic races of the Ouran Outang are truly formidable; are as tall or taller than a man; active, strong, intrepid, cunning, lascivious, cruel; found in many parts of Africa, in the East-Indies, in Madagascar, and in Borneo. In the last, the people of quality court him as we do the stag.

The long-arm'd Monkey

The Magot.

The African Pongo walks on his hinder legs, sleeps under trees, builds a hut to protect him against the sun and the rains; lives only on fruits; not carnivorous. When the negroes make a fire in the woods, this animal comes near and warms himself by the blaze, but has not skill to keep the flame alive by feeding it with fuel. They go in companies; if they meet a man, shew him no mercy; attack the elephant with clubs, and drive him from that part of the forest which they claim. Are stronger than ten men.

The Ape, properly so called, or the *Pithekos* of the ancients, is not above a foot and a half high; walks erect, without a tail, and is easily tamed.

The Long-armed Ape is from two feet to four feet high, walks erect, without a tail, face resembling man, a circle of bushy hair round the visage, eyes are large and sunk in its head, face tanned, ears well proportioned. When it stands erect, its arms reach the ground; so that it can walk on all fours, yet be erect at the same time. Native of the East-Indies, particularly the coast of Coromandel.

The *Cynocephalus*, or Magot (of Buffon) wants a tail, but has a small protuberance formed by the skin; also a large callous red rump; face prominent, approaching the quadruped; covered with a brownish hair; yellow on the belly; three feet and a half or four feet high; native of Africa and the East; fullen, vicious, and untractable.

B A B O O N S.

THESE animals have a short tail, a prominent face, canine teeth larger than those of men, and callosities on the rump; fierce, malicious, and untractable.

The Baboon, properly so called, is from three to four feet high, very strong built, thick body and limbs, and long canine teeth; large callosities behind, quite naked and red; tail crooked and thick, seven or eight inches long; its snout long and thick; on each side of its cheeks, a pouch, into which, when satiated with eating, it puts the remainder; covered with long thick hair, reddish brown; walks commonly on all fours; hands as well as feet armed with long sharp claws, instead of the broad round nails of the ape kind.

When they rob an orchard or vineyard (for they are extremely fond of grapes, apples, and ripe fruit), they go in large companies; part enter the inclosure, but first set a centinel; the rest form a line from their fellows within, to their rendezvous in some craggy mountain; those within the orchard throw the fruit to those without, or, if the wall be high, to those on the top, and these to those beyond them, all along the line: while this is going forward with great expedition, they observe a profound silence.

The natives of the Cape often take them young, and, feeding them with milk, accustom them to guard their houses. Inhabit also Siam.

The largest of the baboon kind is the Mandril; ugly and disgusting, short, from four to five feet high; muzzle long, of a blueish colour, strongly marked with wrinkles; from the nose issues a snout, which the animal at intervals licks off with its tongue; is native of the Gold Coast; said to walk frequently erect, and, when displeased, to weep like a child.

The Wanderow is rather less than the former; tail from seven to eight inches long; muzzle prominent; has a large long white head of hair, with a monstrous white beard, coarse, rough, and descending; the colour of the rest of the body brown or black; equally fierce; yet seems more tractable than most of its kind; is chiefly seen in the woods of Ceylon and Malabar.

The Pigtail is in size no larger than a cat; has a prominent muzzle; the tail five or six inches long, curled up like that of a hog; native of Sumatra. Edwards kept one of them in London; another happening to be exposed in a shew of beasts, he brought the two exiles together. The moment they came into each other's presence, they testified their mutual satisfaction, and seemed quite transported at the interview.

M O N K I E S

HAVE numerous varieties: Bosman mentions above fifty sorts on the Gold Coast alone; and Condamine asserts, that it would take a volume to describe those along the river Amazons; scarce a country in the tropical climates that does not swarm with them; scarce a forest that has not a race distinct from all others; for the monkies of two cantons

cantons never mix with each other, but rigorously observe a separation, and guard their limits from the intrusion of strangers. Neither the tiger nor the lion will venture to dispute their dominion, since they, from the tops of trees, continually carry on an offensive war, and by their agility escape pursuit. The serpent is their chief destroyer, and is often seen winding up the trees where they reside, and if it happen to surprise them sleeping, swallows them before the little animals have time for defence. The monkeys in general inhabit the tops of trees; the serpents, branches nearer the bottom.

To the Negroes they are their greatest plague, and do incredible damage, plundering pretty much like the baboons; are not contented with the first blade of corn, or the first cane, but pull up the most alluring, turn it round, examine, compare it with others, and if they find it to their mind, stick it under one of their arms.

They generally keep in companies, march in order, and obey the voice of some chieftain, remarkable for his size and gravity. One species, which Mr. Buffon calls the Ouarine, is remarkable for loudness and distinctness of voice, still more for their use of it. "I have frequently been a witness," says Margrave, "of their assemblies. Every day, morning and evening, the ovarines assemble in the woods. When all come together, one among the number takes the highest place on a tree, and makes a signal with his hand to the rest to sit round, in order to hearken. As soon as he sees them placed, he begins his discourse, with so loud a voice, and yet in a manner so precipitate, that to hear him at a distance, one would think the whole company were crying out at the same time: however, during that time, one only is speaking, and the rest observe the most profound silence. When this has done, he makes a sign with the hand for the rest to reply; and at that instant they raise their voices together, until by another signal of the hand they are enjoined silence. This they as readily obey; till, at last, the whole assembly breaks up, after hearing a repetition of the same preachment."

The chief food of the monkey-tribe is fruits, buds of trees, succulent roots and plants; are fond of sweets, particularly the pleasant juice of the palm-tree and the sugar-cane. In necessity, eat insects and worms; if near the coasts, oysters, crabs, and shell-fish. Catch oysters by clapping a stone between the opening shells; draw crabs from the water, by putting their tail to the crabs' hole, the crabs fastening on it, they draw them on shore with a jerk. The monkey brings one at a time, sometimes two.

Father Carli, in his history of Angola, assures us, that while his health was impaired by the raging heats of the climate, his patience exhausted by the obstinacy of the natives, and his little provisions daily plundered, without redress, he found more faithful services from monkeys than from men; these he had taught to attend him, to guard him, while sleeping, against thieves and rats, to comb his head, to fetch his water; and he asserts, that they were more tractable than the human inhabitants.

The monkeys of Africa, &c. may be distinguished from those of America by three marks. (1) A naked callous substance behind, on which they sit; which those of America are without. (2) Nostrils differently formed, opening downward; whereas the American monkeys open on each side. (3) Pouches on each side the jaw, into which they put provision; which those of America are without. Also, no monkeys of the ancient continent hang by the tail, as do many of the American.

Mr. Buffon, who has examined this race of beings with great accuracy, makes nine species belonging to the ancient continent.

(1) The Macaguo, somewhat resembling a baboon in size, strength of body, and an hideous wrinkled visage; but differs in having a very long tail, covered with tufted hair: native of Congo.

(2) The Patas is about the same size, has a longer body, and face less hideous; is remarkable for its colour, which is so brilliant a red, that the animal looks as if it were painted: by some called the Red African Monkey.

(3) The Malbrouk, of which he supposes the Bonet Chinois to be a variety. One is remarkable for a long tail and beard; the other for a cap of hair, that covers the crown of the head, from whence it takes the name: natives of the East-Indies. The Bramins have hospitals for such of them as happen to be sick or disabled.

(4) The Mangabey may be distinguished by its eye-lids, which are naked, and of a striking whiteness: native of Madagascar.

(5) The Mona, or Cephus of the ancients, is variegated with black and red; its tail of an ash-colour, two white spots on each side, at its insertion: native of the northern parts of Africa.

(6) The Callitrix, or Green Monkey of St. Jago, distinguished by its beautiful green colour on the back, its white breast and belly, and its black face.

(7) The

The Coaita

(7) The Moustoc, or White Nose, distinguished by the whiteness of its lips, the rest of the face being a deep blue: native of the Gold Coast.

(8) The Talapoin, distinguished by its variety of green, white, and yellow hair; that under the eyes being of a greater length than the rest: supposed to be native of Africa and the East.

(9) The Douc, so called in CochinChina, where it is native; with a long tail; of a size as large as the baboon, and with a flat face like the ape; resembles the American monkeys, in having no callus on its posteriors.

The monkeys of the new continent, Mr. Buffon divides into those with muscular holding tails, called SAPAJOUS; those with feeble, useless tails, called SAGOINS. Of the sapajous are five sorts; of the sagoins, six.

OF THE SAPAJOUS.

The first is the Ouarine, or the Brazilian Guariba; as large as a fox, with black long hair, described p. 115; is the largest monkey of America. This is often called the *Preacher*.

(2) The Coaiti is distinguished by having no thumb, consequently, but four fingers on the two fore-paws. The tail, however, supplies the defects of the hand; and with this the animal flings itself from one tree to another, with surprising rapidity.

(3) The Sajou is distinguished by its yellowish, flesh-coloured face.

(4) The Sai is somewhat larger, and has a broader muzzle; called also the Bewailer, from its manner of lamenting, when either threatened or beaten.

(5) The Samiri, or Aurora, is the smallest and most beautiful of all; of a fine orange colour, with two circles of flesh round the eyes; a very tender, delicate animal.

OF THE SAGOINS.

(1) The Saki, or Sagui, so remarkable for the length of the hair on its tail, that it has been often termed the Fox-tailed Monkey; is of different sizes.

(2) The Tamaim is usually black, with the feet yellow; some brown, spotted with yellow.

(3) The Ouistiti is remarkable for large tufts of hair on its face, and its annulated tail.

(4) The Marikina, or Lion Monkey, with a mane round the neck, and a bunch of hair at the end of the tail, like a lion.

(5) The Pinch, with the face of a beautiful black, and white hair descending on each side the face.

(6) The Mico. The hair on its body a beautiful silver colour, brighter than that of the most venerable human hair; the tail, a deep brown, inclining to blackness; its ears, its cheeks, and lips, tinged with bright vermillion; a very small kind.

THE

MAKI, OR MOCOCO KIND,

FROM the conformation of their hands and feet, approach the monkey kind; but in that respect only. There are many kinds, varying in colour or size, but agreeing in the human-like figure of their hands and feet, and in their long nose.

The Mococo is about the size of a cat; the body and limbs slenderer; a very long tail, at least double the length of its body; covered with fur, marked alternately with broad rings of black and white; remarkable for the largeness of its eyes, which are surrounded with a broad black space; and the length of the hinder-legs, which far exceed those before. When it sleeps, it brings its nose to its belly, and its tail over its head. When it plays, it uses a sort of galloping, with its tail raised over its back, and continually in motion. The head is covered with dark ash-coloured hair; the back and sides, with a red ash-colour, not so dark as the head; the whole glossy, soft, and smooth, and standing almost upright, like the pile of velvet. Native of Madagascar; a gentle animal; moves, like all four-handed animals, in an oblique direction.

The Mongooz is less than the former, with a soft, glossy robe, but a little curled; nose also thicker; eyes black, orange-coloured circles round the pupil; some black, others brown: native of Madagascar.

The Female Opposum

The Vari is much larger than either of the former; its hair much longer; has a kind of ruff round the neck, of very long hair, by which it may be distinguished from the rest; fierce and savage; its voice somewhat resembles the roaring of the lion: native of Madagascar.

To this tribe we may refer a little four-handed animal, of the island of Ceylon, which Mr. Buffon calls the Lori; of all quadrupeds the longest, in proportion to its size; having nine vertebræ in the loins; whereas others have only seven. The body appears longer, by having no tail; resembles the maki kind in its hands, feet, snout, and the gloss of its hair; about the size of a squirrel; and appears to be a tame, harmless little animal.

OF THE

O P P O S S U M K I N D.

THESE seem to unite the monkey and the rat; are less than the former; have long tails, almost bare; their fur, as well as their shape, resembling the rat kind. Some have ranked them in that class; but their being four-handed is sufficient distinction.

The Opposum is found in N. and S. America, in Java, &c. the size of a small cat. The head resembles a fox; has fifty teeth in all, two great ones in the midst, like those of a rat; eyes little, round, clear, lively, placed upright; ears long, broad, transparent, like those of the rat kind; its tail round, long, a little hairy in the beginning, but quite naked towards the end; fore-legs short, about three inches long; those behind, four. The feet are like hands, each having five fingers, with white crooked nails, rather longer behind than before. In this animal, the thumb on the hinder-leg wants a nail, whereas the fingers, are furnished with clawed nails as usual. Remarkable for a false womb, into which the young, when brought forth, creep, and continue to lodge and suckle securely: which is thus described:

Under the belly of the female is a kind of slit or opening, three inches long, composed of a skin, which makes a bag internally, covered on the inside with hair; herein are the teats of the female, and into it the young retire. This bag is opened or shut at the will of the animal, and
so

so close, that in the living animal the opening can scarce be discerned. This bag contains glands that exude a musky substance, which communicates to the flesh of the animal, and renders it unfit to be eaten. The young, when first produced, are in a manner but half completed (and some assert, not much larger than flies); on quitting the womb, they creep into the receptacle, where they continue *fixed* to the teat till they have acquired strength sufficient. On their first entrance, they seldom stir out; when more advanced, they venture forth often in the day; at last, seldom use their retreat, except in necessity.

The Opposum, on the ground, is slow and helpless; but climbs trees with great expedition; chiefly subsists on birds; hides among the leaves of the trees to seize them by surprise; often hangs by the tail, which is long and prehensile, for hours, head downwards, watching for prey. If any animal pass underneath, it drops upon and quickly devours it. By means of its tail, swings from one tree to another, hunts insects, and escapes pursuers. Seems to live on vegetable as well as animal substances, sugar-canes, the bark, and even the leaves of trees. Is easily tamed, but is a disagreeable domestic.

The Marmose, found in South-America, seems only to differ in size, being less; and, instead of a bag to receive its young, has only two longitudinal folds near the thighs. The young, when first produced, are not above the size of a bean; but continue sticking to the teat, until they have arrived at greater maturity.

The Cayopolin is somewhat larger, its snout more pointed, its tail longer, and its colour different, being ash, inclining to yellow.

The Phalanger, or Surinam Rat, resembles the former, but differs by the thumb and fore-finger of its hinder-hands being joined together, except at the extremities; is about the size of a rat.

The Tarsier resembles the former, in having four hands and a long tail; differs in the extreme length of its hinder-legs, which are longer than its whole body. The bones of that part of the foot called the tarsus, are likewise very long; from whence the animal has received its name: the tail is naked in the middle, and hairy at both extremities; its hair woolly, soft, and a deep ash colour.

O F

AMPHIBIOUS QUADRUPEDS.

ALL quadrupeds of this kind, though covered with hair, are furnished with membranes between the toes. Their paws are broad, their legs short, fitted for swimming, for taking short strokes, and quickly repeating them. Some, like the otter, resemble quadrupeds, except as being web-footed; others, like the beaver, are not only web-footed, but have the tail covered with scales. Others, as the seal and the morse, have the hind-feet stuck to the body like fins. And others, as the manati, have no hind-feet, and never come on shore. But all get their living in the water; all continue long under water; when pressed by danger, fly to the water for security; and, when upon land, are timorous and unwieldy.

The **OTTER** resembles quadrupeds in shape, hair, and internal conformation; but resembles the aquatic tribes in its manner of living, and in having membranes between the toes to assist it in swimming. It swims even faster than it runs, and can overtake fishes in their own element. Its colour is brown; it is long, slender, and soft skinned; is about two feet long from nose to tail; the head and nose are broad and flat; the neck short; the body long; the tail broad at the insertion, but tapering to a point; the eyes are very small, and placed nearer the nose than usual in quadrupeds; legs very short, but remarkably strong, broad and muscular. Their joints articulated so loosely; that the animal can turn them quite back, and bring them on a line with the body, so as to perform the office of fins. Each foot is furnished with five toes, connected by strong broad webs like those of water-fowl.

The otter attends the sides of lakes and rivers, but particularly the former; is seldom fond of fishing in a running stream; but in rivers always swims against the stream, and meets the fishes, its prey, rather than pursues them. In lakes it destroys much more than it devours, and often spoils a pond in a few nights. The otter catches its prey from the bottom upward, or, pursuing it into some little creek, seizes it there. This animal, upon taking in a quantity of air, can remain some minutes at the bottom: there whatever fish passes over it is certainly taken; for, as

the eyes of fish are placed so as not to see under them, the otter seizing them by the belly, drags them on shore, where it often leaves them untouched, to continue the pursuit for hours. In winter, when the lakes are frozen, and the rivers pour a rapid torrent, the otter is often greatly distressed, and obliged to live on grass, weeds, and even bark; then courageous from necessity, it feeds on insects, rats, and even sheep. It has the power of continuing long without food, and, though not torpid like the marimotte, yet keeps much within its retreat, which is usually the hollow of a bank worn under by the water. There it often forms a kind of gallery, running along the edge of the water; when attacked at one end, it flies to the other, and often evades the hunter by plunging into the water at forty or fifty paces distance, while he expects to find it just before him. Couples about the middle of summer, and brings forth at the end of nine weeks, generally three or four at a time. The otter brings forth generally under hollow banks, on a bed of rushes, flags, or weeds, on the side of some river or lake. The entrance of its hole is generally under water. The young are always at the water-edge; the dam teaches them to plunge swiftly, like herself, and escape among the rushes or weeds. Though never so young, they swim with great rapidity, no part of them being seen above water, except the tip of the nose.

When caught young, they are carefully fed with small fish and water; but, as they gather strength, milk is mixed among their food, their fish provision is gradually retrenched, and at length they are fed wholly on bread. The training them to hunt for fish requires assiduity and patience; but an otter, thus taught, is a valuable animal, and will catch fish enough not only for itself, but for a family. Has been seen, at the word of command, to drive fish into a corner, and bring off the largest to its master.

Otters inhabit most parts of the world; different in size and colour. In North-America and Carolina are white, inclining to yellow. The Brazilian otter is much larger than ours, with a roundish head, almost like a cat. The tail is but five inches long; the hair is soft, short, and black, except on the head, where it is of a dark brown, with a yellowish spot under the throat.

The Beaver.

T H E B E A V E R.

THE Beaver, merely as an individual, is exceeded by many other quadrupeds in cunning, and by almost all in powers of defence. When kept in a state of solitude or tameness, is gentle and familiar enough; dull, and even melancholy; of moderate passions and appetites; calm and indifferent, without attachment or antipathy, neither seeking to offend, nor desiring to please; has little industry, few tricks, nor cunning sufficient to avoid the most obvious snares. The only quadruped that has a flat broad tail, covered with scales, which, as a rudder, directs its motions in the water. The only quadruped that has membranes between the toes on the hind feet only, and none on the fore feet, which supply the place of hands, as in the squirrel. The only animal in its fore parts resembling a quadruped, in its hinder parts a fish; is about two feet long, near one foot high, shaped somewhat like a rat. Its colour, a light brown; the hair of two sorts; one longer and coarser; the other soft, fine, short, and silky. The teeth are like those of a rat or a squirrel, long, strong, admirably adapted to cutting timber or stripping bark; has but one vent for the emission of its excrements, and its urine.

The beavers assemble in June and July from every side, and generally form a company of above two hundred. The place of meeting is commonly where they fix their abode, and always by the side of some lake or river. If it be a lake in which the waters are always level, they omit building a dam; but on a running stream, subject to floods and falls, they build a dam or pier, that crosses the river, to form a dead water above and below; built where the river is shallowest, and where some great tree grows by the side, which they make a principal part in their building; and set about cutting it down. This they accomplish by their teeth, which soon lay it level, and on the side they wish it, which is always across the stream. Then cutting off the top branches, they make it lie close and even, as the principal beam of their fabric.

The dam is ten or twelve feet thick at the foundation, sloping on that side next the water; on the opposite side perpendicular; towards the top, about two feet broad, made of wood and clay. They raise the dike according to the elevation of the water. They swim with their clay mortar

tar on their tails, and with stakes between their teeth, to where they are wanted.

The dike being completed, they next erect their several apartments, which are either round or oval, and divided into three stories, one above the other: the first below the level of the causeway, is for the most part full of water; the other two above it, that in case of the water's increase, they may move a story higher. If they find any little island contiguous to their reservoir, they occupy it, and improve their dwelling. They drive piles into the earth, to secure their habitation against the wind as well as water. They make two apertures, at the bottom, to the stream; one a passage always kept neat and clean; the other for conveying soil of all sorts. A third opening or door-way, much higher, prevents their being shut up when the frost and snow have closed the apertures of the lower floors. Sometimes they build on land; but sink trenches five or six feet deep, to descend into the water.

In August, or September, they begin to lay in stores. During summer, they regale themselves on the choicest fruits and plants. In winter, their provisions are the wood of the birch, the plane, and some few other trees, which they steep in water in quantities proportioned to their numbers. They cut down branches from three to ten feet in length. According to some curious naturalists, the stock of timber for ten beavers, is about thirty feet in a square surface, and ten in depth. They regularly take out those parcels only which have been duly steeped in the water, and impartially divide it.

The hunters, knowing that green wood is more acceptable to them than what is dry, plant a quantity of it round their lodgments; and when they come out to partake of it, catch them in snares; or take them by surprise. When the frosts are very severe, they sometimes break a large hole in the ice; and when the beavers resort thither for fresh air, either kill them with their hatchets, or cover the opening with a large substantial net. After this, they undermine the whole fabric; whereupon the beavers fly with the utmost precipitation to the water; and plunging into the aperture, fall into the net, and are taken.

The Phoca.

THE SEAL, OR PHOCA.

THE Seal resembles a quadruped in some respects, and a fish in others. The head is round; the nose broad; the teeth like those of a dog; the eyes large and sparkling; no external ears, but holes; the neck of a moderate length; the body thickest at the shoulders; from whence the animal tapers to the tail. The body is covered with a thick bristly shining hair, which looks as if rubbed over with oil. The feet of this animal, though furnished with the same number of bones as quadrupeds, yet are so stuck on the body, and covered with a membrane, that they resemble fins, except by their claws. The fore-feet are greatly hid under the skin, and are covered with a thick skin, which serves like a fin, for swimming; have five claws, long, black, and piercing. The hind-feet are stretched out on each side the short tail, covered also with a hairy skin, and almost joining at the tail. These being turned backwards, are useless on land; so that when the animal moves, it drags itself forward by its fore-feet.

This animal is found from four feet long to nine; some black, others spotted, white, or yellow. Were the size of the brain to determine the quantity of understanding, the seal would of all animals be the most sagacious; for it has, in proportion, the largest brain of any, but the size of its brain furnishes it with little increase of wisdom. Its tongue is forked or slit at the end, for what purpose we are ignorant. By a singularity of conformation, the *foramen ovale* in the heart is open; so that, though the blood of this animal *commonly* circulates through the lungs, yet it *can* circulate directly through the heart, whereby, being under no immediate necessity of breathing, the vital motions are carried on while in the water: but though it can continue several minutes under water, yet it is not able, like fishes, to remain there for any length of time; is seldom found distant from the shore, but basking on the rocks; when disturbed, plunges at once to the bottom. Numbers are generally seen together; found in every climate, but in the north and icy seas particularly, by thousands, basking on the rocks, and suckling their young. They are animals of passage, and perhaps the only quadrupeds that emigrate. On the north coasts of Greenland they retire in July, and return in September. They make a second departure in March to cast their young, and return in June, young and all together, observing in their route a certain fixed time and track, like birds of passage. The females

in our climate bring forth in winter, and rear their young on some sand-bank, rock, or desolate island. Suckle their young, sitting up on their hinder legs. The seals follow and destroy the herrings when in the shoals by thousands. They are very swift in deep waters, dive rapidly, and, while the spectator eyes the spot, they emerge an hundred yards distance. The weaker fishes, therefore, can escape their tyranny, only by darting into the shallows. They are extremely watchful, sleep seldom longer than a minute, then raise their heads; if they see no danger, lie down again. The only method to procure them, is to shoot them: if they escape, they hasten to the deep, flinging stones and dirt behind them as they scramble along crying; if overtaken they vigorously resist with their feet and teeth, till killed.

A variety of this animal, is the Sea-lion, described in Anson's voyage, from eleven to eighteen feet long. So fat that the blubber lies a foot thick all round the body. Differs from the seal, as it often grazes along the shore, and on the long grass that grows up the edges of brooks,

THE MORSE.

THE Morse has very particular formation of teeth, having two large tusks pendent from the upper jaw; it also wants cutting teeth. In form resembles a seal, but is from twelve to sixteen feet long. Generally frequent the same places, have the same habitudes; the same advantages, and the same imperfections as seals. The tusks are from two to three feet long; and the ivory of the finest quality.

THE MANATI.

NEVER leaves the water, and lives only there; is not a quadruped, for it has but two legs; nor is it a fish, for it is covered with hair. It forms a link uniting the two tribes; the last of beasts, or the first of fishes.

The Manati is somewhat shaped like the seal; has the fore legs pretty similar, with four claws only: shorter in proportion, and placed nearer the head; its tail is that of a fish, spread out broad, and wanting even the rudiments of those bones which make the legs and feet. The largest are twenty-six feet long; the skin is blackish, very tough, and hard; having a few hairs scattered, like bristles, of about an inch long. The eyes are very small, in proportion to the animal's head; and the ear-holes

holes so narrow as scarce to admit a pin's head. The tongue is so short, that some have pretended it has none at all; and the teeth are composed of two solid white bones, running the whole length of both jaws, and formed merely for chewing. The female has breasts placed forward; brings one at a time: which she holds with her paws to her bosom; where it sticks, and accompanies her wherever she goes.

This animal never leaves the water, but advances its head out of it, to reach the grass on the river sides. Feeds entirely on vegetables; is never found far in the open sea, but chiefly in the large rivers of South America, and often two thousand miles from the ocean. Is also found near Kamtschatka. Has no voice nor cry; the only noise it makes, is by fetching its breath hard.

THE HIPPOPOTAMUS

SHOULD perhaps have been placed first in the list of amphibious; but that the otter being native of our own country, has so much greater probability of being known, either by inspection or description, to the reader. It usually forms a distinct genus, and may be so considered here. Is above seventeen feet long, from the snout to the tail; above sixteen feet in circumference round the body; and above seven feet high: the head is near four feet long, and above nine feet in circumference. The jaws open about two feet wide, and the cutting teeth, of which it hath four in each jaw, are above a foot long. Its feet are divided into four parts; tail short, flat, and pointed; the hide amazingly thick, and though not capable of turning a musket-ball, impenetrable to the blow of a sabre. The body is covered over with a few scattered hairs, of a whitish colour. The whole figure of the animal is something between that of an ox and a hog, and its cry between the bellowing of the one, and the grunting of the other.

Chiefly resides at the bottom of the great rivers and lakes of Africa, where it leads an indolent kind of life, seldom disposed for action, except when excited by hunger. Upon such occasions, three or four, at the bottom of a river, near some cataract, form a kind of line, and seize on such fish as are forced down by the stream. In water they pursue their prey with great swiftness and perseverance; swim with much force, and remain at the bottom thirty or forty minutes without rising to take breath. They walk on the bottom of the stream, as if on land. On

land it is awkward and unwieldy, moves but slowly; seldom forsakes the margin of the river; sinks every step it takes. If forced, by famine, into the higher grounds, commits dreadful havoc among the plantations: the natives see their possessions destroyed, without daring to resist their invader; by lighting fires, striking drums, and raising a cry, they generally frighten it back to its favourite element. Never attacks boats as they go up or down the stream; but should they inadvertently strike against or disturb it, there is danger of its sending them to the bottom. "I have seen," says a mariner, "one of these animals open its jaws, and seizing a boat between his teeth, at once bite and sink it to the bottom. I have seen it upon another occasion, place itself under one of our boats, and rising under it, upset it with six men which were in it; who, however, happily received no other injury."

If this animal be attacked too powerfully at land, it returns to the river, where it enters head foremost, and after a short time rises to the surface, loudly bellowing. Though the negroes will attack the shark, or the crocodile in their natural element, and destroy them, they decline to engage the hippopotamus.

The hippopotamus lives on fish, vegetables, and probably flesh, when he can get it. The female comes on land to bring forth, it is supposed one at a time. These animals are then particularly timorous, and the instant the parent hears the slightest noise, it dashes into the stream; and the young one follows with equal alacrity. The young are said to be excellent eating.

THE TAPIR.

THE Tapiir may be considered as the hippopotamus of the New Continent; but degraded both as to size and ferocity; bears some distant resemblance in form to a mule; has a long snout, which it lengthens or contracts at pleasure. Ears small, long, and pendent; neck and tail short; claws strong, and firm, four on each foot; skin thick, covered with brown hair. The natives made shields of it, which could not be pierced by an arrow. Chiefly resides in water, but feeds entirely on vegetables in the pastures by the river-side. Is very timorous; the instant it hears the least noise, plunges into the stream. Are greatly sought after by the natives; their flesh is considered as a delicacy, and thought by some not inferior to beef.

The Morse.

The Pangolin

SCALY AND SHELLY QUADRUPEDS.

THE PANGOLIN.

HAS been injudiciously called the Scaly Lizard, but it resembles the lizard only in general form, and in being covered with scales. The lizard may be considered as a reptile, produced from an egg; the pangolin is a quadruped brought forth alive and perfectly formed. The lizard is all over covered with the marks of scales; the pangolin has scales neither on the throat, the breast, or the belly. The scales of the Lizard seem stuck upon the body even closer than those of fishes; the scales of the pangolin are only fixed at one end, and capable of being erected, like the quills of the porcupine, at pleasure. The lizard is a defenceless creature; the pangolin can roll itself into a ball, like the hedge-hog, and present the points of its scales to the enemy, which effectually defend it.

It is about three or four feet long, the tail as much more; has a small head, very long nose, short thick neck, long body, legs very short, tail extremely long, thick at the base, and terminating in a point; has no teeth, five toes on each foot, with long white claws; is chiefly distinguished by its scaly covering, which defends all parts, except the under part of the head and neck, under the shoulders, the breast, the belly, and the inner side of the legs; all which are covered with a smooth soft skin, without hair. Between the shells, at the interstices, are hairs like bristles, brown at the extremity, and yellow toward the root. The scales are of different sizes and forms, stuck on the body somewhat like the leaves of an artichoke. The largest are, near the tail (which is also covered with them), three inches broad, two inches long, thick in the middle, sharp at the edges, and terminated in a roundish point; extremely hard like horn; convex above, a little concave within; one edge sticks in the skin, the other laps over that immediately behind it, of a dusky brown colour, and when the animal has acquired its full growth, so hard, as to turn a musquet-ball.

The instant it perceives danger, it rolls itself up like the hedge-hog, and presents to the assailant only the cutting edges of its scales. Its long tail encreases its security, being lapped round the body, and defended with shells more cutting than any others. These shells, so large, so thick, so pointed, repel every assault: the tiger, the panther, the hyæna, vainly attempt it by treading on, or rolling it about. The Ne-
groes

back, sides, rump, and the tail to the very point; but not the throat, breast or belly, which are covered with a white soft skin, yet offer rudiments of shells, even in their softest parts. Complete ossification takes place only on parts of least friction, and most exposed. By means of the divisions in its shell, the animal has a motion in its back. The bands are various in number and size; generally, two large pieces cover, one the shoulders, the other the rump. Between these, the bands lap over each other. Besides their opening cross-ways, they also open along the back. They are differently coloured in different kinds, but usually are a dirty grey. The shell itself is covered with a softish skin, smooth and transparent.

The armadillo has the same method of protecting itself as the hedgehog or the pangolin. When attacked, it withdraws its head under its shells, tucks its feet under its belly, while the tail serves as a strengthening band: thus it becomes like a ball, flattish on each side. In this situation it is tossed about by other quadrupeds, and little resembles a creature endowed with life. The Indians, by laying it close to the fire, soon oblige the poor animal to unfold itself.

Though native of the warmest parts of America, yet it bears our climate. Their motion seems to be a swift walk, they can neither run, leap, nor climb trees. Their resource, when pursued, is to make toward their hole as fast as they can; or, to make a new one. For this they require but a very few moments advantage, having four claws on each foot extremely large, strong, and crooked. If caught by the tail when making their way into the earth, by their resistance they leave their tail in the hand of their pursuer. The flesh of the smaller kinds is said to be delicate eating. If the armadillo be near a precipice, it often escapes by rolling itself up, and tumbling from rock to rock. They are sometimes taken in snares laid for them by the sides of rivers and low moist places, which they particularly frequent. Their burrows are very deep, and they seldom stir out but at night, and never far from their retreats.

They mostly root the ground, like a hog, in search of roots. They eat also melons, vegetables, and flesh, when they can get it. They frequent watery places, where they eat worms, small fish, and water insects, and are frequently found in the same hole with the rattle-snake.

The first of this kind, has three bands between the two large pieces that cover the back, is called the Tatu Apra. The tail is shortest in this kind, being about two inches long, while the whole shell is one
foot

foot long and eight inches broad. (2) The Tatou of Ray, or the Encoubert of Buffon, has six bands across the back; is about the size of a pig of a month old, has a small long head and a very long tail. (3) The Tatulette, with eight bands, much smaller; tail longer, and legs shorter. Its body about ten inches long, the tail seven. (4) The pig-headed Armadillo, with nine bands, two foot long from nose to tail. (5) The Kabassou, or Cataphractus, with twelve bands, often found above three feet long, is never eaten. (6) The weasel-headed Armadillo, with eighteen bands, a large piece before, and nothing but bands backward, above a foot long; tail five inches. The Kabassou and the Encoubert are the largest; the rest are of a much smaller kind.

In the large kinds, the shell is much more solid than in the others, and their flesh much harder. These generally reside in dry upland grounds, but the small species in moist places. When rolled into a ball, those whose bands are fewest are least capable of covering themselves up completely. The Tatou Apra, when rolled up, presents two great interstices between its bands, by which it is easily vulnerable.

THE ELEPHANT.

THE elephant, at first view, presents an enormous mass of flesh covered with a callous hide, without hair; legs scarcely formed for motion; little eyes, large ears and long trunk; and an air of extreme stupidity which subsides when we come to examine its history. But these favourable appearances encrease our surprise when we consider the various advantages it derives from so clumsy a conformation, and the admirable sagacity connected with it.

The elephant is from seven to fifteen feet high. The forehead high and rising, ears very large and dependant, eyes extremely small, the trunk long, body round and full, back rising in an arch, the whole figure short in proportion to its height. The feet are round at bottom; on each foot are five flat horny risings, which seem to be the extremities of toes. The hide not hairy. At the end of the tail is a tuft of hair, a foot and a half long. The female is less than the male, and the teats between the fore legs.

The

The strongest and largest of quadrupeds; yet, neither fierce nor formidable. Mild, peaceful, and brave, it never abuses its power, and only exerts its force for its own protection. Is a social creature: the oldest conduct the band; the young, the weak, and sickly, fall into the centre; the females carry their young, and keep them from falling by means of their trunks. Wherever they march, the forests seem to fall before them; they bear down the branches upon which they feed, and, if they enter an inclosure, quickly destroy the labours of the husbandman.

They delight to live along the sides of rivers, in the deepest vales, in the most shady forests. They cannot live far from water, and always disturb it before they drink. Often fill their trunk, either to cool it, or to divert themselves by spurting it out like a fountain. Are equally distressed by extremes of heat and cold.

Their food is vegetable.

The elephant is remarkable for its hearing. Appears delighted with music, readily learns to beat time, to move in measure, and even to join its voice to the sound of the drum and the trumpet.

Its sense of smelling is exquisite, pleased with the same odours that delight mankind. Gathers flowers with great pleasure, picks them up one by one, unites them into a nosegay, and seems charmed with the perfume. The orange flower seems to be particularly grateful to it.

In the sense of touching, it excels all the brute creation, and perhaps even man. This sense lies wholly in the trunk, which is, properly speaking, only the snout lengthened out, hollow, ending in two openings, or nostrils. An elephant of fourteen feet high has the trunk about eight feet long, and five and an half in circumference at the mouth, where it is thickest: a partition runs through it. Is capable of being lengthened or shortened, bent or straightened, pliant, yet strong. To aid its grasp, are several little eminences, like a caterpillar's feet, on the under-side, which probably contribute to the sensibility of its touch. Through this trunk the animal breathes, drinks, and smells: at the very point of it, just above the nostrils, is an extension of skin, about five inches long, in the form of a finger. By this, the elephant can take a pin from the ground, untie the knots of a rope, unlock a door, and even write. By sucking up its breath through the extremity of the trunk, it lifts and sustains a weight.

The neck is so short that it can scarce turn its head. The legs bend not without difficulty. While the elephant is young, it bends the legs to lie down; when old, or sickly, this is not performed without assistance.

The sole of the foot is furnished with a skin as thick and hard as horn, which completely covers the under part of the foot. Its two enormous tusks are unserviceable for chewing, and only weapons of defence. These, as the animal grows old, become so heavy, that it is sometimes obliged to make holes in the walls of its stall to ease itself of the fatigue of their support. They proceed from the upper jaw, and are sometimes six feet long.

The elephant is only native of Africa and Asia: there are none in the northern parts of Africa at present. In Africa, the largest do not exceed ten feet high; in Asia they are found from ten to fifteen. The usual colour of the elephant is a dusky black, but some are said to be white; and these are inestimable. The elephant never breeds in a state of servitude.

To take them wild, a spot of ground is fixed on, which is surrounded with a strong pallisade, made of the thickest and strongest trees, and strengthened by cross bars. Posts are fixed at such distances, that a man can easily pass between; only one great passage is left open, which shuts behind when the beast is entered. A female elephant is conducted into the heart of the forest, where it is obliged by its keeper to cry out for the male, who readily answers and hastens to join her: the keeper obliges her to retreat, repeating the cry, till she leads the animal into the enclosure, which grows narrower all the way, till he finds himself completely shut up. After a day and a night, its indignation subsides. In a fortnight it is completely tamed. The elephant, when tamed, becomes gentle and obedient; conceives an attachment for its attendant, caresses, obeys him, and frequently takes such an affection to its keeper, that it will obey no other. Receives his orders with attention, executes them with prudence, eagerly, yet without precipitation. Kneels down to receive its rider. Seems to take a pleasure in the finery of its trappings. Can carry on its back three or four thousand weight; on its tusks alone can support near a thousand. Its ordinary pace is as fast as a horse can easily trot; when pushed, it can move as swiftly as a horse at full gallop. Can travel with ease fifty or sixty miles a day.

THE RHINOCEROS.

THE rhinoceros is usually twelve feet, from the nose to the tail; six to seven feet high; the circumference of its body is nearly equal to its length. Has a horn, growing from the snout, sometimes three feet and an half long; without this, that part would resemble the head of a hog; the upper lip is much longer in proportion, ends in a point, is very pliable, serves to collect its food, and deliver it into the mouth: ears large, erect, and pointed; eyes small and piercing; skin naked, rough, knotty, and lying upon the body in folds; of a dirty brown colour; so thick as to turn the edge of a scymiter, and to resist a musquet ball: the belly hangs low; the legs are short, strong and thick, and the hoofs divided into three parts, each pointing forward.

Native of Asia and Africa, and found in those extensive forests frequented by the elephant and the lion. Subsists entirely on vegetable food; is peaceful and harmless: though it never provokes the combat, disdains to fly; and, every way fitted for war, rests content in security. Is particularly fond of the prickly branches of trees, and feeds on such thorny shrubs as would be dangerous to other animals, either to gather or to swallow. Is sometimes taken in pit-falls, covered with green branches, laid in paths which the rhinoceros makes in going from the forest to the river side.

Some found in Africa have a double horn, one growing above the other. This weapon is one of the strongest, and most dangerous, that nature furnishes to any animal: is entirely solid, formed of the hardest bony substance, growing from the upper maxillary bone, by so strong an apophyse, as seemingly to make but one with it.

GIRAFFE, OR CAMELOPARDALIS.

ITS head somewhat resembles a deer, with two round horns (which perhaps it sheds), a foot long, blunt, thick, and tufted with hair; its neck resembles a horse; its legs and feet, a deer; fore legs much longer than the hinder. Its tail resembles a horse, but has less hair.

Its hoofs are extremely black, obtuse, and spread. A kind of mane runs all down its spine; inclining backwards to half way of the back, then inclining forwards, and near the tail inclining backwards again. This mane is long on the neck, short toward the tail. Its eyes have eye-lashes of stiff hair; some stiff hairs also round the mouth. A bony kind of tubercle makes a sort of third horn on the forehead. Ears large. Its teeth, resembling those of deer, are made entirely for vegetable pasture. It is beautifully speckled with brown or black spots, on a light brownish or dirty white ground: the females lighter than the males. Timorous and harmless; lives entirely on the leaves of trees; always carries its head very high. Kneels down to drink. Its motion is a kind of pace, the two front or two hind legs moving together; runs awkwardly, and badly. Often lies down on its belly. Was known to the ancients, but rarely seen in Europe. Pompey exhibited, at one time, no less than ten. Inhabits the internal regions of Africa.

The dimensions of a young one, brought from the Cape of Good Hope, were as follows: Length of the head, one foot eight inches; the fore leg, from the ground to the top of the shoulder, ten feet; from thence, to the top of the head, seven, making together seventeen feet; height of the hind leg, eight feet five inches: from the top of the shoulder, to the insertion of the tail, seven feet. Sometimes are twenty-five feet from nose to tail.

THE BEAR.

OF the bear, are three different kinds; the brown bear of the Alps, the black bear of North America, which is smaller, and the great Greenland or white bear. Of the same habitudes, carnivorous, treacherous and cruel.

The brown bear is properly an inhabitant of the temperate climates; the black finds subsistence in the northern regions of Europe and America: the great white bear inhabits the most icy climates. The brown bear, savage and solitary, takes refuge in the most dangerous precipices of uninhabited mountains; in the gloom of the forest, in some cavern hollowed by time, or in the hollow of some old enormous tree. There, alone, it passes some months in winter without provisions, and without stirring
abroad;

abroad; not entirely deprived of sensation. - Seems to subsist on the exuberance of its former fat, and only feels the calls of appetite, when what it had acquired in summer is wasted. When the bear retires to its den for the winter, it is extremely fat; but at the end of forty or fifty days, when it comes forth to seek fresh nourishment, it seems to have slept away all its flesh. Couples in autumn; time of gestation unknown: the female takes great care to provide a proper retreat for her young, in the hollow of a rock; where she provides a bed of hay. Brings forth in winter; the young begin to follow her in spring.

The voice of the bear is a kind of growl, interrupted with rage, often capricious. Capable of some degree of instruction: can dance in awkward measures on its hind feet, to the voice or to the instrument of its leader; and is often the best performer of the two. When come to maturity, can never be tamed. The least dangerous method of taking it is by intoxicating it, by throwing brandy upon honey, of which it is very fond. In Canada, they are taken by setting fire to their retreats, which are often thirty feet from the ground. The old one generally first issues from her den, and is shot by the hunters. The young ones, as they descend, are caught in a noose. Their hams, and especially their paws, are said to be a great delicacy.

The white Greenland bear, though it preserves the general external form of its southern kindred, grows to above three times their size. The brown bear is seldom above six feet long; the white bear often from twelve to thirteen. The brown bear is made strong and sturdy; the Greenland bear, though covered with very long hair, is slender; the head, neck, and body, more inclining to the shape of the greyhound. Seems the only animal, that in the coldest climate grows larger than those of its kind in the temperate zones. Come down to view our sailors on their shores with an awkward curiosity; approach slowly, as if undetermined. When shot at, or wounded, endeavour to fly; finding that impracticable, make a fierce and desperate resistance.

The number of these animals about the north pole, is amazing. They are not only seen at land, but often on ice floats, several leagues at sea; and are transported in this manner to the very shores of Iceland, where the natives are in arms to receive them. It often happens, when a Greenland and his wife are out at sea, by coming too near an ice-float, a white bear unexpectedly jumps into their boat, and, if he does not overset it, sits calmly where he first came down, and like a passenger suffers himself to be rowed along.

Lives chiefly on fish, seals, and dead whales; seldom removes far from the shore. When forced by hunger, ventures into the deep, swims after seals, and devours whatever it can seize; is but a bad swimmer, and is often hunted by boats, till fatigued, and at last destroyed.

THE RACCOON.

THE racoon, which some have called the Jamaica rat, is about the size of a small badger; body short and bulky; fur fine, long, and thick, blackish at the surface, grey toward the bottom; nose rather shorter, and more pointed than that of a fox; eyes large and yellow; teeth resembling those of a dog; tail thick, but tapering, marked with rings of black, at least as long as the body; forefeet much shorter than the hinder; both armed with five sharp claws, with which, and his teeth, the animal makes a vigorous resistance. Like the squirrel, uses its paws to hold its food (differs from the monkey kind, which use but one hand, whereas the racoon and the squirrel use both). Though short and bulky, yet very active; by its pointed claws it climbs trees with great facility; runs up the trunk with the same swiftness that it moves on the plain; and sports among the extreme branches with great agility; moves forward chiefly by bounding, and though it proceeds obliquely, has speed enough frequently to escape its pursuers.

Native of the southern parts of America, found in noxious abundance, in Jamaica, on the mountains; often descends to feed on the sugar-cane. The planters consider these animals as one of their greatest miseries; have contrived various methods of destroying them, yet they propagate in such numbers, that neither traps nor fire-arms can thin them; so that a swarm of these famished creatures do more injury in one night, than the labours of a month can repair.

When tame, is harmless and amusing; capable of being instructed in various tricks. Is playful and cleanly: eats of every thing given it; if left to itself, no cat can be a better provider; examines every corner, eats flesh, boiled or raw, eggs, fruits, corn, insects, snails, worms and beetles; has a particular fondness for sweets. Will eat its provisions dry,

The Ant Bear,

dry, but will by choice dip them in water, if it happens to be in the way. Has a peculiarity in drinking, as well by lapping like the dog, as by sucking like the horse.

THE COATIMONDI.

ITS snout somewhat resembles that of the hog, but is greatly elongated; the neck and the body are long, the fur short, the eyes small, the upper jaw an inch longer than the lower, and the snout, which is moveable in every division, turning up at the end. Sets up on the hind legs, and in this position, with both paws, carries the food to its mouth. Length from nose to tail eighteen inches.

Is very apt to eat its own tail, which is sometimes longer than its body (some of the monkey kinds do the same, and seem to feel no pain in wounding a part of the body so remote from the centre of circulation). Of playful qualities, and indiscriminate appetite; at liberty will pursue poultry, and destroy every living thing it can conquer; though playful with its keeper, yet obstinate against receiving instruction: neither threats nor caresses can induce it to practise any arts to which it is not naturally inclined. When it sleeps, rolls itself up in a lump, and so continues often fourteen or fifteen hours together. Inhabits Brazil.

THE ANT-EATERS

HAVE been classed, by Mr. Buffon, into the larger tamandua (our ant-bear), the smaller tamandua, and the ant-eater. The ant-bear is four feet long, from the snout to the tail; legs short, armed with four strong claws; tail long and tufted; the animal often throws it on its back like the squirrel. The tamandua is eighteen inches long, the tail without hair, trails on the ground as the animal moves. The ant-eater is not above seven inches from the snout to the tail. The two former are of a brown dusky colour, this a beautiful reddish, mixed with yellow.

Though they differ in figure, they resemble in slenderness of snout, and amazing length of tongue. The two last have prehensile tails.

The ant-bear is neither numerous, nor often seen; its retreats are in the most barren parts of South America only; resides chiefly in woods, hides itself under fallen leaves; lives entirely upon ants and insects, which are found in abundance, and often build hills, many feet high. Near an ant-hill, it creeps slowly on its belly, cautiously concealing itself, till within a proper distance; there lying close, it thrusts forth its round red tongue (often two feet long) across the path of these busy insects, and lets it lie motionless. The ants swarm upon it; but where they touch they stick; held by a slimy fluid, which covers the tongue. Though without teeth, fights with its claws very obstinately against the dog, and even the jaguar: throws itself on its back, fastens on its enemy with all its claws, sticks with great perseverance, and even, after killing its invader, remains fastened upon him with vindictive desperation.

THE SLOTH.

OF the sloth, are two kinds, distinguished by their claws; the Unan with only two claws on each foot, and without a tail; the Ai, having a tail, and three claws on each foot. The unan has the snout longer, the ears more apparent, and the fur very different; differs also in the number of its ribs, having forty-six, while the Ai has but twenty-eight. Nevertheless these two animals strongly resemble each other in their general outlines and manners.

The fur of the Ai is coarse and staring, somewhat resembling dried grass; tail very short, mouth large, eye dull and heavy, feet with three claws, the feet short, but longer than its legs; proceeding from the body obliquely, so that the sole of the foot seldom touches the ground. When the animal is compelled to step forward, it scrapes the back of its nails along the surface, and wheeling its leg circularly about, still touching the ground, at length places its foot: limb after limb is moved with equal difficulty, not above three feet in an hour.

Lives entirely on vegetable food, the leaves, fruit, and flowers of trees. Has four stomachs; and generally strips a tree of its verdure in less

The Sloth

The Ant-eater.

less than a fortnight; but unwilling to quit, while any thing alive remains, it devours the bark, and shortly kills the tree on which it fed. Utterly unable to descend, it is obliged to drop to the ground like a shapeless heavy mass, then journeys to some neighbouring tree. Often takes a week in crawling to a tree not fifty yards distant. Every step it emits a most plaintive, melancholy cry, accompanied with tears; which excites disgust, mixed with pity. This seems its chief defence. When at length it reaches its destined tree, mounts it with much greater ease than when moving on the plain: devours with famished appetite, and, as before, not sparing the very source of its supplies. Has but one common vent. Lives some time after its nobler parts are wounded, or taken away.

THE GERBOA

HAS four feet, but, in running or resting, uses only the hinder, yet is one of the swiftest creatures in the world.

Is not above the size of a large rat. Its head not totally unlike a rabbit, its teeth resemble those of the rat kind; two cutting teeth in each jaw; a very long tail, tufted: head, back and sides covered with large ash-coloured soft hair; breast and belly whitish, the fore-legs not an inch long, four claws and a thumb on each; the hinder legs two inches and a quarter, exactly resembling those of a bird, having but three toes, the middle longest.

Found in Egypt, Barbary, Palestine, and the deserts; its fore-paws grasp its food, and in some measure perform the office of hands. Jump six or eight feet at a bound; extremely swift. Are lively, harmless, live on vegetables, burrow like rabbits. Are more expert diggers than the rabbit; when pursued, if they cannot escape by their swiftness, they try to make a hole instantly in the ground. Is provident, and lays up for winter. Cuts grass in heaps of a foot square, which, when dried, carries into its burrow for food or warmth.

The following animal has much external resemblance to the Gerboa: what is its true station, must be decided by future observations; our latest information is as follows.

THE KANGAROO.

Extract from Captain Tench's "Account of Botany-Bay."

"**O**F the natural history of the kangaroo we are still very ignorant. We may, however, venture to pronounce this animal a new species of opossum, the female being furnished with a bag, in which the young is contained; and in which the teats are found. These last are only two in number; a strong presumptive proof, had we no other evidence, that the kangaroo brings forth rarely more than one at a birth. But this is settled beyond a doubt, from more than a dozen females having been killed, which had invariably but one formed in the pouch. Notwithstanding this, the animal may be looked on as prolific, from the early age it begins to breed at; kangaroos with young having been taken of not more than thirty pounds weight; and there is room to believe that, when at their utmost growth, they weigh not less than one hundred and fifty pounds. A male of one hundred and thirty pounds weight has been killed, whose dimensions were as follow: Extreme length seven feet three inches; the tail three feet four inches and a half; the hinder legs three feet two inches; the fore paws one foot seven inches and a half; the circumference of the tail at the root one foot five inches. After this, perhaps, I shall hardly be credited when I affirm, that the kangaroo, on being brought forth, is not larger than an English mouse. It is, however, in my power to speak positively on this head, as I have seen more than one instance of it.

In running, this animal confines himself entirely to his hinder legs, which are possessed with an extraordinary muscular power. Their speed is very great, though not in general quite equal to that of a greyhound; but when the greyhounds are so fortunate as to seize them, they are incapable of retaining their hold, from the amazing struggles of the animal. The bound of the kangaroo, when not hard pressed, has been measured, and found to exceed twenty feet.

When young, the kangaroo eats tender and well-flavoured, tasting like veal; but the old ones are more tough and stringy than bull-beef. They are not carnivorous, and subsist altogether on particular flowers and grass. Their bleat is mournful, and very different from that of any other animal; it is, however, seldom heard but in the young ones."

The head, neck, and shoulders are very small in proportion to the body,

Fig. 2.

The Bat

Fig. 1.

body, which, though tapering upwards, enlarges below. Tail nearly as long as the body, tapering toward the end, covered with a short fur, except the head and ears, which bear a slight resemblance to the hare. Probably the difference of size in this creature, indicates different kinds.

THE BAT.

THE bat somewhat resembles a bird, in its power of sustaining itself in the air; though its motion is very awkward and struggling—but, it brings forth its young alive, suckles them, has teeth; and its lungs, its intestines, and its skeleton are like those of quadrupeds.

The bat, most common in England, is about the size of a mouse; or nearly two inches and an half long. Its membranes, called wings, are properly an extension of the skin all round the body (not the head), which, in flying, is stretched, by the four interior toes of the fore feet, which are enormously long. The first toe is loose, and serves as a heel when the bat walks, or as a hook, when it would adhere to any thing. The hind feet are disengaged from the surrounding skin, and divided into five toes, somewhat resembling those of a mouse. The skin, by which it flies, is of a dusky colour. The body is covered with a short fur, of a mouse-colour, tinged with red. The eyes are very small; the ears like those of a mouse.

It appears early in summer, flies in the dusk of evening. Frequents the sides of woods, glades, and shady walks; often skims along the surface of water. Pursues gnats, moths, and nocturnal insects; and will not refuse meat. Its flight is laborious, irregular; and, if interrupted, it cannot readily acquire a second elevation. Appears only in pleasant evenings; flies in pursuit with its mouth open. At other times abides in its retreat, the chink of a ruined building, or the hollow of a tree. Thus, even in summer, sleeps the greatest part of its time, never venturing out by day-light, nor in rainy weather. Its short life is further abridged by a torpid state, during winter. Often hangs by its hooked claws to the roofs of caves, regardless of surrounding damps. Such as seek not deep retreats of uniform temperature, often perish by the weather becoming so mild in winter as to warm them prematurely into life, and to allure them from their holes in quest of food, when they exhaust themselves in pursuit of insects which are not to be found.

The bat couples and brings forth in summer, from two to five. The female has two nipples, forward on the breast. She makes no nest for her young, but is content with the first hole she meets, where sticking herself by her hooks, she permits her young to hang at the nipple, for the first or second day. When she finds a necessity of stirring abroad, she sticks her little ones to the wall as she before hung herself; where they cling till her return.

The bat has strong pectoral muscles to assist its flight, and weak legs, (wherein it agrees with birds). And is never seen to walk, or rather to push itself forward with its hind legs, but in extreme necessity. The toes of the fore legs, or, if we may use the expression, its very long fingers, extend the web-like membrane between them; which being extremely thin, serves to lift the little body into the air: where, by unceasing percussion, the animal continues, and directs its flight; but is fatigued in less than an hour.

Among its varieties, are the long-eared bat, which is very small; the horse-shoe bat, with an odd protuberance round its upper lip, in form of a horse-shoe; the rhinoceros bat, with a horn growing from the nose.

But the race of bats in the East and West-Indies, are truly formidable; and in such numbers, that, when they fly, they obscure the setting sun.

The largest we certainly know of, is the roussette, or great bat of Madagascar; near four feet broad, wings extended; one foot long, from the nose to the tail. Is fox-coloured; its head and nose also resemble that animal; and some have called it the Flying-fox: it differs in the number of its teeth; and in having a claw on the fore foot, which is wanting in ours. Inhabits Madagascar, the coasts of Africa and Malabar. When they repose, they stick to the tops of the tallest trees, with their heads downward. When in motion, like clouds, they darken the air, day and night, destroying the ripe fruits of the country, and sometimes settling on animals, or man: they devour fruits, flesh, insects, and drink the juice of the palm tree: their horrid din is heard at night in the forests, at two miles distance; at the approach of day, they retire. Some have observed, that the ancients seem to have taken their harpies from these fierce and voracious creatures, as they agree to many parts of the description, being equally deformed, greedy, uncleanly, and cruel.

But still more mischievous is the American Vampire; less than the former; more deformed, and more numerous. Has a horn like the rhinoceros bat, and extremely long ears. These enter towns and cities, and, after sun-set, cover the streets like a canopy. "They are," says

Ulloa,

Ulloa, "the most expert blood-letters in the world." The inhabitants of those warm latitudes being obliged, by the excessive heats, to leave open the doors and windows of their chambers, the vampyres enter, and if any part of the body be exposed, they fasten on it, and suck the blood; often the person dies under the operation. "I have been assured," continues he, "by persons of the strictest veracity, that such an accident has happened to them; and that, had they not providentially awaked, their sleep would have been their passage into eternity; having lost so large a quantity of blood as hardly to find strength to bind up the orifice. The reason why the puncture is not felt is, besides the great precaution with which it is made, the gentle, refreshing agitation of the bat's wings, which contribute to encrease sleep, and soften the pain." Ulloa supposes, the puncture is made by a single tooth. Mr. Buffon supposes the wound is inflicted by the tongue. Others think that, without inflicting any wound, by continual suction, it enlarges the pores of the skin, till the blood passes. But all agree as to the fact, though they disagree as to the manner.

These animals are a great pest of South America; and often prevent the peopling many parts of that continent: having destroyed at Barja, and several other places, the cattle brought there by the missionaries to form a settlement.

THE SENATE OF THE STATE OF NEW YORK,
 IN SENATE CHAMBER, Albany, January 13, 1857.
 REPORT
 OF THE
 COMMISSIONERS OF THE LAND OFFICE,
 IN ANSWER TO A RESOLUTION PASSED BY THE SENATE,
 APRIL 18, 1856.
 ALBANY: PUBLISHED BY THE STATE OF NEW YORK,
 1857.

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SURVEYS OF NATURE.

PART THE FOURTH.

WE come now to a large division of creatures, entirely distinct from what have hitherto engaged our attention. It is true, we have seen quadrupeds flying, or rather leaping (as the squirrel), and labouring a progressive motion (as the bat), but far from being able to endure, and continue this exercise, they soon become enfeebled: still less have they power to attain great elevation, or to float on the atmosphere as if at rest. Their flight was a deviation from the general nature of quadrupeds, wherein they approached to somewhat of a bird; as the incapacity of some birds for flight, deviates also from the general nature of their kind, and somewhat approaches a quadruped: nevertheless, the great distinction between these kinds of creatures is, the capacity of one to rise in air, while the other is confined to residence on the earth.

To this quality of rising contribute, (1) Their external shape; (2) Their clothing of feathers; (3) The great strength of their pectoral muscles; (4) Their capacity of inhaling considerable quantities of air: most probably connected with a principle whereby they accommodate themselves to the different degrees of rarity in the air, as they ascend to considerable heights.

The external shape of birds, is evidently adapted to pierce through a yielding medium; *sharp* at first—gradually swelling—its chief bulk in the middle—and its termination not sudden, but diminishing—yet, by means of the tail, capable of expansion: the very construction of a swift sailing vessel!

The capability of expansion, or retraction, appears to great advantage in the construction of their clothing: is remarkable also in their wings and tail, whereby they occupy greater space in the fluid wherein they move, without augmenting their weight. A wing, when folded, is in so close union with the creature's body, as to make a part of it; but when expanded, is incomparably beyond the effect of oars on a vessel: not only is it generally spread, but all its parts, not only its joints, but its feathers assume a new direction, and as so many *radii* from the centre of their insertion diverge as much as may be, to occupy a greater space; yet never so much as to leave vacuities between any two.

Feathers are not merely adapted for flight, by strength combined with lightness, by elasticity, and by form; but, as defensive, they protect their wearer from injury, and, as clothing, they answer every purpose of warmth and comfort. They generally are uniform in their position, are laid all the same way, one over another, regularly, neatly, so as to make a perfectly *smooth* superficies, whose external *evenness* may prevent settlements of water, &c. while, next the body, a cherishing soft down forbids the penetration of cold to injure its wearer. To maintain this smoothness, which, by exposure to accidents, is liable to be destroyed, the bird has a gland situated on the rump, furnished with an excretory duct; this supplies an oil, for the purpose of dressing the feathers, which the bird communicates to each feather as wanted, by drawing it through his bill, in which he has previously gathered a quantity. Water-fowl have this oil in the greatest abundance, land-fowl have less, and those domesticated very little: These are rarely far from shelter; and nature bestows nothing superfluous or useless.

A feather

A Feather is an admirable instance of artful appointment: its quill strong, but not solid; its stem spongy and flexible, its vane or beard, subdivided into many parts, each resembling a feather; having other parts rising from them, whose hooked terminations keep fast hold of their neighbours; and by a kind of interweaving (easily separable if necessary, yet able to resist the impulses of the air) complete the unitedness of the whole. The combination seems thus: the hooked offspring from the vanes unite the vanes; the vanes of one feather lying *over* those of another, unite the feathers into compactness. In the shaft of a feather is the pith, which nourishes the stem, and its parts. Feathers are generally placed according to their length and strength, so that their duty is proportioned to their ability.

The wing is situated in birds according to its intent: where it is little used, beside being small, it is less accurately placed to poise the body, and to receive the whole force of its moving powers, and is usually *squat*; where it is the instrument of extensive excursion, it is longer, less fleshy, and very carefully fitted. At the extremity, is a kind of finger-like appendage, usually called a *bastard-wing*. The beards of wing-feathers are remarkably broad on one side, and narrow on the other: the narrow side of one lying over the broad side of its fellow, contributes to the strength of the whole; by introducing its stem to the support of its fellow, where weakest.

The manner in which most birds rise is thus: they quit the earth with a bound, in order to have room for flapping the wing; then they strike the body of air beneath the wing with its whole under surface; but, to avoid striking the air on the upper side with equal violence, the wing is instantly contracted; so that the creature rises by the impulse of this first blow, till it spreads the wing for a second. For this reason, birds choose to rise against the wind, because they have a greater body of air on the under than on the upper side of the wing. For these reasons also large fowls do not rise easily, because they have not sufficient room at first

for the motion of their wings, and because the body of air does not lie so directly under the wing as they rise.

The office of the pectoral muscles being to move the wings, they are endowed with peculiar strength: the stroke of a swan's wing would break a man's leg, and such a blow from an eagle has deprived a man of life. Beside mere strength, they have occasion also for perseverance: their efforts must often be maintained long together; and this in birds of passage is remarkable: they possess not the power of an eagle, but possibly they exceed many of that kind in continuance; some birds seem always flying, and are found hundreds of leagues from shore, ever on the wing.

The toes in some are webbed, to fit them for the waters; in others separate for their better clasping. Those with long legs have also long necks, or how could they gather their food? But those with long necks have not always long legs; we instance in swans and geese.

The bones of birds are extremely light and thin though compact, and the muscles (except those moving the wings) extremely slight. The tail, which is composed of quill-feathers, balances the head and neck; directs their flight like a rudder, and greatly assists in descending.

We find by ourselves, that rapid motion speedily induces difficulty of breathing; yet the principal muscles used in such exercise, are not seated around the lungs: were our arms exerted with equal violence (of which they are unable) their effects might be greater. To prevent this impeded respiration in birds, their lungs (commonly called the sole) adhere to the ribs and back, and very little dilate or contract. But the branches of the wind-pipe open into them, while these open into the cavity of the belly, and convey the air inhaled by breathing into certain receptacles like bladders, running the length of the whole body: so that air blown into the wind-pipe will distend the animal's body like a bladder; consequently they have great facility of long and large inspiration. Sometimes also the wind-pipe makes many convolutions within the body of the bird, and is then called the labyrinth; but of what use are these convolutions is not known.

I suspect

I suspect also, that as some birds have a vacuity between the flesh and skin, so that air blown between swells them externally (*i. e.* their skin), while their flesh remains little affected; so birds, which rise to great heights, may swell and dilate themselves when high, more than when low; to counteract the effect of the rarer medium at those heights, against which strength of wing is a feeble resource.

Birds have, properly speaking, but one stomach; but different in different kinds. In the rapacious kinds that live on animal food, and in some of the fish-feeding tribes, the gullet is replete with glandulous bodies, which dilate and moisten the food as it passes; the stomach is always large, and generally wrapped round with fat, to increase its warmth.

In granivorous birds, the gullet dilates just above the breast-bone, and forms a pouch or bag, called the crop; this contains salivary glands to moisten its contents. They are very numerous, with longitudinal openings, which emit a whitish and viscous substance. After a convenient time the food passes into the belly, where (instead of a soft, fat, moist stomach, as in the rapacious kinds) it is ground between two pair of muscles, commonly called the gizzard, covered on the inside with a ridgy coat, almost cartilaginous. These ridgy coats, rubbing against each other, are capable of bruising and attenuating the hardest substances, even iron or stones.

Birds are in general very much longer-lived in proportion than quadrupeds: the age of quadrupeds is calculated at about seven times the interval between their birth and maturity; that of birds is probably ten or twelve times that interval. Their diseases are few: the most remarkable is their moulting. We have seen somewhat resembling this among quadrupeds; but in birds it is most notorious. We have seen the stag cast his horns, the camel his coat, the rabbit his fur; we have seen winter assimilate to its snows the clothing of polar animals, and their varying colours return in spring; but in birds, this change is so powerful, that they

become hardly recognizable: especially the difference is great between a young bird, and one which has often undergone this operation.

During this season, those most remarkable for courage become timid, and those of weakly constitutions often die. All cease to breed; and their whole nourishment is absorbed by the nascent plumage, whose progress seems to be as follows,——

A quill or feather, when come to its full size, grows harder as it grows older, and receives a kind of periosteum or skin round its shaft. In proportion as the quill hardens, its diameter shrinks, its nourishment decreases, and it becomes loose in its socket, till at length it falls. In the mean time, the rudiments of an incipient quill are beginning. The skin forms a little bag, which is fed by a small vein and artery, and which daily increases till protruded. While one end vegetates into the beard or vane of the feather, that attached to the skin is soft, and receives a constant nourishment, which it diffuses through the whole by the pith. When the quill is full grown, the vein and artery diminish, and at length disappear. The quill thus deprived continues in its socket, till after its proper time it shrinks, loosens, and quits its place to a successor.

We have seen quadrupeds dwell in subterranean habitations, in dens, in burrows, or among trees; inhabitants of the air may be expected to choose a free communication with their peculiar element, they decline therefore *depth* as not to them secure; and nestle in the grove, the forest, or the field, on the shore, or among rocks, in hopes of concealing their abode from the eye of hungry enmity.

Quadrupeds being viviparous, the male has little opportunity of testifying his satisfaction till the young appear; but among birds, the male contributes to the advancement of the future progeny; sometimes by positive incubation, sitting on the eggs in the absence of the female, sometimes by his song, cheering his consort, and anticipating his endearments, and sometimes by catering for her while confined in her important occupation. When the
young

young rise into life, is the summit of both their joys, both are transported with pleasure, and elated with pride: at this period, the most timid become courageous, the rapacious become unusually fierce and active: They carry their prey, yet throbbing with life, to the nest, and early accustom their young to slaughter. While the young are unfledged, the parents provide them regular supplies; and feed each in its turn. When the family is plumed, and capable of flight, they are led forth when the weather is fine, and taught the art of subsistence; where their food lies, and the method of discovering and securing it: they return to the nest, for a day or two, but when able to shift for themselves, the old ones forsake them, and totally disclaim all future connexion.

The greatest number of birds remain in their native districts. The rook, if undisturbed, never desires to leave his native grove; the black-bird frequents his accustomed hedge; and the red-breast, though seemingly mild, claims a certain district, from whence he seldom moves, but drives out every one of the same species. Why then do birds of passage yearly forsake us, and regularly return? — Few subjects are so much involved in darkness.

Food is probably one cause, yet those which in cages have plenty of food, are equally anxious, as if they were starving: temperature is probably another cause; yet those sheltered and kept warm, are equally restless. Do they fly from man in countries too well inhabited for their repose? Whence have the young this knowledge? However it be, it seems a preconcerted undertaking: They associate in some open place, several days before their departure, and, by an odd kind of chattering, seem to debate the subject. They take flight together, and often in such numbers, that, to mariners at sea, they seem like a cloud that rests on the horizon. By far the greatest number make good their intention; but many grow weary, and spent by fatigue.

Of the numerous tribes of the duck kind, that frequent our shores—we know scarce more than five that breed here. The rest contribute to form that amazing multitude of water-fowl which
5
annually

annually repair to the dreary lakes and deserts of Lapland, where they perform the duties of incubation and nutrition in full security, among lakes, rivers, swamps, and mountains, covered with thick and gloomy forests. Here the ground remains moist and penetrable during the summer; here the woodcock, snipe, and slender billed birds feed at ease; while the web-footed birds find food in plenty from infinite swarms of insects. From hence they descend at the approach of winter in numbers absolutely innumerable; and which Linnæus has observed for eight whole days and nights to cover the surface of the river Calix.

It has been often a subject of astonishment, how these creatures should perform such long journeys, should know whither to steer, and when to set out. It is probable they rather follow the weather than the country; and that they proceed as they continue to find the atmosphere favourable, of the minuter variations of which they are probably speedily sensible and early apprized.

Thus some birds by migrating inhabit every part of the earth; in general each climate has its peculiar birds. Those of the temperate zone have little beauty of plumage, but the smaller kinds have exquisite melody of voice. Those of the torrid zone are of bright and vivid colours, but of screaming voices, or are silent. The frigid zones boast little of either melody or brilliancy, but abound with birds of the aquatic kinds, whose clothing is warm not shewy, and substantial not gaudy.

The number of quadrupeds little exceeds two hundred kinds: of these, by grouping them together, we have obtained a tolerably distinct conception, having given to each that portion of attention which its importance might claim: there is much greater difficulty, in endeavouring to acquire equally determinate knowledge of birds, because (1) their numbers are greater, probably exceeding a thousand, even omitting many varieties. (2) They are spread as well over the waters as the land. (3) Their changes are greater in the course of their lives. (4) The difference between the sexes is stronger. (5) The influence of climate is very
con-

considerable. (6) They seem capable of uniting their varieties more than quadrupeds are. (7) With regard to some of them, though we can describe their manners while with us; we know little of their procedures while absent: in short, birds more easily escape our pursuit than quadrupeds; and consequently our knowledge is built on more distant acquaintance.

Thus circumstanced, must we give up the pursuit of knowledge, or be content with what is attainable? Certainly, these obstacles may excite diligence in the observer, and candour in the instructed; for evidently much remains obscure, and equally evidently, what is discovered has been the work of time, and the effect of labour, toil, trouble, expence, dexterity, genius, and remark, which though they may err, yet on the whole deserve praise; and though not complete in knowledge, may justly assume a credit for all that is known.

OF THE
DISTINCTIONS OF BIRDS.

THE legs and toes distinguish land from water fowl. Land birds have divided toes, without any membranes between them. Those that wade, have legs usually long and naked; those that swim, have the toes webbed together: these are leading distinctions of nature itself.

Land birds of the rapacious kind, have a large head, a strong crooked beak, notched at the end; strong short legs, and sharp crooked talons; bodies fibrous and muscular; wings well feathered and expansive. The sight of such as prey by day is astonishingly quick; and such as ravage by night see objects in obscurity with extreme precision.

Formed for war, they lead a life of solitude and rapacity. Their fierceness extends even to their young, which they force from the nest, at a time when they still should protect and support them.

Birds of prey are remarkable for one singularity. The males are a third less, and weaker than the females. Hence the male is called by falconers, a *tiercel*; a tierce or third less than the other. The females are of greater size, more beautiful and lovely for shape and colours, stronger, more fierce and generous, than the males: probably it is necessary for the female to be thus superior, that she may efficaciously protect herself, and her young, not only from enemies, but from the male himself; since it is out of her power to secrete them, as we have seen the females of beasts of prey. Otherwise perhaps some access of fury from displeasure or despair might prompt him to destroy them.

BIRDS *BILLS.*

BIRDS

FEET

BILLS

The Great Eagle.

THE EAGLE, AND ITS AFFINITIES.

OF these the Golden Eagle is the largest. Weighs twelve to eighteen pounds. His length three feet to three and a half; extent of wings, seven feet to eight and a half; bill three inches long, deep blue colour; eye hazel. His sight and smell very acute. Head and neck clothed with narrow sharp-pointed feathers, deep brown bordered with tawney; those on the crown of the head, by age, become grey. The body throughout, is dark brown; the back feathers clouded with a deeper shade. Wings reach to the end of the tail: The quill feathers are chocolate colour, the shafts white. Tail deep brown, barred and blotched with obscure ash-colour, usually white at the roots of the feathers. Legs yellow, short, very strong, three inches in circumference, feathered to the very feet. Toes covered with large scales, armed with formidable claws, the middle one two inches long.

Found in mountainous and ill-peopled countries; breed among the loftiest cliffs, the same nest serves them for life. Powerful but magnanimous, disdains smaller plunder; nor, till after long provocation, punishes the teazings of the rook or the magpie. Disdains to share the plunder of another bird: never stoops to carrion; never returns to the same carcass. Solitary, keeps the desert to himself; of sparkling eyes; strong breath; loud and terrifying cry; fierce, proud, not easily tamed, even by great patience and much art: though taken young, and subdued by long assiduity, still dangerous, and often to its master. If, when let loose, it first stoop toward the ground, then rise perpendicularly into the clouds, it quits its domesticity for ever; but if brought to an attachment for its feeder, is highly serviceable, both for pleasure and profit: will hunt not only game, but the fox, or wolf.

Of all birds flies highest, and has the quickest eye (but his smell far inferior to the vulture). Pursues by sight. When he has seized his prey, stoops from his height, as if to poise its weight: always lays it on the ground before he carries it off. Finds it difficult to rise when down; seizes geese, cranes, hares, lambs, and kids; often destroys fawns and calves, drinks their blood, and carries part of their flesh to his retreat. Infants have been destroyed by them. Smith, in his history of Kerry, relates, that a poor man in that country got a comfortable subsistence for his family, during a summer of famine, out of an eagle's nest, by robbing the eaglets of food, clipping their wings, and retarding their flight.

Her eggs seldom exceed two in the larger species, and three in the smallest. Are hatching about thirty days; frequently one egg is addled. It is asserted, that when the young are somewhat grown, the mother kills the most feeble or the most voracious. They are first white, then yellow; at last light brown. Age, hunger, captivity, diseases, make them whiter. Is said to live above an hundred years; and to die, not of old age, but from the beak turning inward on the under mandible, and thus preventing their taking food. Drinks but seldom, perhaps, at liberty not at all, as the blood of his prey serves to quench his thirst.

The Sea-Eagle and the Osprey live chiefly upon fish. Build their nests on the sea-shore, by the sides of rivers, on the ground among reeds. Often lay three or four eggs, rather less than those of a hen. They catch their prey, by darting down upon them.

The Bald-Eagle of North Carolina has peculiar habits. When the eaglets are just covered with down, and a sort of white woolly feathers, the female eagle lays again. These eggs are hatched by the warmth of the recent young, whereby the flight of one brood makes room for its just hatched successors. These birds fly very heavily. They often attend a kind of fishing-hawk, which they strip of its prey. Generally also attend fowlers in the winter, and seize birds that are wounded.

M. Buffon considers, as genuine eagles, only the golden eagle first described, the common eagle, and the little eagle; thereby separating those which reside entirely on land, from those which prey in waters.

The *common eagle* is brown, head and upper part of the neck inclining to red; tail-feathers white, blackening at the ends; outer ones, on each side, ash-coloured; legs covered with feathers of a reddish brown.

The *bald eagle*, brown; head, neck and tail-feathers white; those of the upper part of the leg brown.

The *white eagle*, the whole white.

The *rough-footed eagle*, dirty brown; spotted under the wings, and on the legs, with white; the tail-feathers white at the beginning and point; leg-feathers dirty brown, spotted with white.

The *white-tailed eagle*, dirty brown; head white; stems of the feathers black; rump inclining to black; tail-feathers, first half black, the end half white; legs naked.

The *erne*, dirty iron colour above, iron mixed with black below; head and neck ash, mixed with chestnut; points of the wings blackish; tail-feathers white; legs naked.

The *black eagle*, blackish; head and upper part of the neck mixed with red; tail-feathers, the first half white, speckled with black, the other half blackish; leg-feathers dirty white; thought to be only a variety of the common brown eagle.

The *sea eagle*, inclining to white, mixed with iron brown; belly white, with iron coloured spots; covert feathers of the tail whitish; tail-feathers black at the extremity; the upper part of the leg-feathers iron brown.

The *osprey*, brown above; white below; back of the head white; outward tail-feathers, on the inner side, streaked with white; legs naked.

The *Jean le blanc*: above, brownish grey; below, white, spotted with tawney brown; tail-feathers on their outside and extremity brown; inside, white, streaked with brown; legs naked.

The *eagle of Brasil*, blackish brown; ash colour, mixed in the wings; tail-feathers white; legs naked.

The *Oroonoko eagle*: with a topping, above, blackish brown; below, white, spotted with black; upper neck yellow; tail-feathers brown, with white circles; leg-feathers white, spotted with black.

The *crowned African eagle*, with a topping; the tail of an ash colour, streaked on the upper side with black.

The *eagle of Pondicherry*: chestnut colour; the six outward tail-feathers black one half. Said to be the most highly ornamented bird of the kind, in regard to mixture of colours.

THE VULTURE, AND ITS AFFINITIES.

VULTURES are distinguished by the nakedness of their heads and necks, which are only covered with a very slight down, or a few scattered hairs. Their eyes are prominent. Claws shorter, less hooked than the eagle's. The inside of the wing covered with thick down, different from all other birds of prey. Their attitude and their flight heavy.

The Golden Vulture seems foremost of the kind. From the beak to the tail, is four feet and a half; to the claws forty-five inches. The upper mandible nearly seven inches long; the tail twenty-seven. Neck, breast

breast and belly red ; faint on the tail, deeper near the head : the back black ; wings and tail yellowish brown.

Cruel, unclean, indolent ; amazingly acute of smell, having two large nostrils without, and an extensive olfactory membrane within. Have both a crop and a stomach ; which may be regarded as a kind of gizzard, from the extreme thickness of its muscles ; whereby they seem adapted to eat corn, &c. when necessary for subsistence.

In Africa and Asia, are found in great abundance. The inside down of their wing is converted into a warm kind of fur, and is sold in the Asiatic markets. In Egypt are great flocks of them around the city of Grand Cairo, which are protected, and repay that protection by their services, in devouring the carrion and filth which might otherwise corrupt the air. In America they follow the hunters at a little distance ; when they see a beast dead and abandoned, they call out to each other, pour down on the carcass, and pick its bones bare. " At the Cape of Good Hope," says Kolben, " they have a wonderful method of separating the flesh from the bones, yet leaving the skin entire. It often happens that an ox returning home from the plough, lies down by the way : then, if the vultures perceive it, they fall furiously down, and inevitably devour him. They sometimes attempt them grazing, and, to the number of a hundred, or more, make their attack together. Their sense of smelling is so exquisite, that the instant a carcass drops, the vultures, floating from all quarters, come fousing on their prey." They eat lambs, &c. serpents are their ordinary food. They perch, several together, on old pine and cypress-trees, where they continue all the morning, with their wings unfolded : nor are they fearful, but suffer people to approach them very near, particularly when they are eating. Their sloth, filth, and voraciousness almost exceed credibility. When they have liberty to feed at their ease, they so gorge themselves, that they are unable to fly ; but keep hopping along when pursued (at all times are of slow flight, and with difficulty rise from the ground) ; being utterly helpless : But they often vomit up what they have eaten, and then they fly off with greater facility.

There is perpetual enmity between the vulture of Brazil, and the crocodile, which lays its eggs (above a hundred) in the sands, on the side of the river. She takes every precaution to hide the place : but a number of vultures (or galinassos, as the Spaniards call them) sit, silent and unseen, concealed in some neighbouring forest, and view her operations. They wait till she has laid all her eggs ; has covered them carefully

The first of the great birds of the world is the eagle. It is the king of the birds, and is found in every part of the world. It is a bird of prey, and feeds on other birds and animals. It is a very powerful bird, and is able to fly at a great height. It is also a very intelligent bird, and is able to learn to do many things. It is a very beautiful bird, and is admired by all who see it.

The second of the great birds of the world is the hawk. It is a bird of prey, and feeds on other birds and animals. It is a very powerful bird, and is able to fly at a great height. It is also a very intelligent bird, and is able to learn to do many things. It is a very beautiful bird, and is admired by all who see it.

The King of the Vultures.

fully under the sand, and is retired; then, encouraging each other with cries, they pour down on the nest, lay the eggs bare, and devour the whole brood without remorse.

Lay two eggs at a time, produce once a year. In Europe make their nests in inaccessible cliffs, nor descend but when forced by inclement seasons. Among the most remarkable birds of this class, is the following—

The king of the vultures is native of America, in size equals a turkey; his wings not so long as many vultures, his bill strong and thick, its base environned and covered with a large indented orange-coloured skin, rising to the head, somewhat like the comb of a cock; in this are placed the nostrils, which are oblong; this comb falls on either side, according to the movement of the bird's head. The eyes are surrounded by a scarlet-coloured skin, the iris has the colour and lustre of pearl, the head and neck are without feathers; covered with a skin, which is flesh-coloured on the top of the head, bright red behind, duskier before. Below the hind part of the head rises a little tuft of black down, from whence issues and extends on each side, under the throat, a wrinkled skin; brownish, behind mingled with red and blue, streaked with little lines of black down; the cheeks or sides of the head are covered with black down; and between the bill and the eyes, behind the corner of the bill, is on each side a spot of brownish purple; on the upper part of the neck, is on each side a small longitudinal streak of black down; the space between them dusky yellow, the sides of the neck are red gradually changing to yellow; below the naked part of the neck, is a collar formed by long softish feathers, deep ash-coloured, which surrounds the neck, and falls on the breast. Into this collar the bird sometimes shrinks his neck, and part of his head, as into a kind of hood, whence some have called him monk. The breast, belly, thighs, and legs, are white; the wings and tail black. The feet are in some yellowish, in others blackish; the claws are short and crooked. It is the most beautiful of the family. Neither its habits or instincts vary from those of the tribe; being slow, cowardly, living on rats, lizards, serpents, and carrion or excrement, when it happens. The flesh is so bad, that even savages themselves cannot abide it.

THE

THE FALCON, AND ITS AFFINITIES.

OF many of the ancient falcons, formerly used in the chase, we know only the names. Those used at present, are the gyr-falcon, the falcon, the lanner, the sacre, the hobby, the kestrel, and the merlin. These are called the long-winged-hawks, to distinguish them from the goshawk, the sparrow-hawk, the kite, and the buzzard, that are of shorter wing; and too slow, cowardly, indolent, or obstinate to furnish amusement in the field. Of the generous tribe of hawks, the wings reach nearly as low as the tail. The first quill of the wing longest; which the second always nearly equals, and terminates in a *point*, which begins to diminish at about an inch from its extremity. In the baser races, the tail is longer than the wings, the first feather of the wing is *rounded* at the extremity, and the fourth feather the longest.

The generous race is from this length of wing swifter, from their swiftness bolder, and, from native generosity, more docile than the other.

The gyr-falcon exceeds all others in size, approaching nearly in magnitude to the eagle. The top of the head is flat, ash-coloured; bill blue, strong, thick, short; on the back and wings marked with black spots heart-shaped. Courageous and fierce, he fears not the eagle himself; but chiefly flies at the stork, heron, and crane. Native of the colder regions of the North, but maintains his strength and courage in milder climates.

The falcon-gentil and the peregrine-falcon, are much less than the gyr, and about the size of a raven. The falcon-gentil moults in March, often sooner; the peregrine-falcon moults in August. The peregrine is stronger in the shoulder, has a larger eye, more sunk in the head, his beak stronger, longer legs, and his toes better divided.

The lanner is now little known in Europe. The sacre is distinguished by legs of a blueish colour. The hobby is used for smaller game, for daring larks, and stooping at quails. The kestrel was trained for the same purposes. The courage of the merlin, though he is not much larger than a thrush, is formidable to birds ten times his size. He has often been known to kill a partridge or a quail at a single pounce. In this he may be considered as a specimen of the species.

The hare, partridge, or quail profitably repay the trouble of taking; but the most delightful sport is the chase of the heron, kite, or wood-lark. For these, when threatened by the approach of the hawk, rise into the skies,

almost perpendicularly (accompanied by their ardent pursuer, who tries to rise above them), till they are lost in the clouds; they descend struggling together; but after a desperate defence, the falcon proves victorious. When a lark is pursued by a couple of merlins, the amusement is, to see one of them mounting to get the ascendant of the lark, while the other, lying low for the best advantage, waits the success of its companion's efforts; thus, while one stoops to strike its prey, the other seizes it coming down. The kite or the goss-hawk approach their prey side-ways: these falcons dart perpendicularly on their game; descending from the clouds an amazing height, with inevitable swiftness.

The baser races being less courageous are more patient; and, less swift, are more cunning. The kite, distinguished by his forked tail, and his slow floating motion, seems almost ever on the wing, and to rest on the air without effort. He lives on accidental carnage; ever prowling, hungry and desperate; is exquisite of sight; when to us invisible by his height, will fly round and round to mark a clutch of chickens, and suddenly dart like lightning on one of the brood, and carry it off in spite of resistance.

There is a black kite, whose tail is not forked, in size rather less.

The buzzard is sluggish, inactive, and often remains perched whole days on the same bough. Lives more on frogs, mice, and insects, than on birds; or by robbing the nests of other birds, and sucking their eggs. His figure expresses stupidity of disposition. Some are white, some have whitish heads, others are spotted.

The honey-buzzard, the moor-buzzard, and the hen-harrier, all of this stupid tribe, differ chiefly in size, growing less in the order named. The goss-hawk and sparrow-hawk are short-winged, and unfit for training, however injurious they may be to the pigeon-house. Length of body 20 or 21 inches; extent of wings expanded, four feet and a half; tail eight inches.

This kind being greatly spread has several varieties in foreign parts, differing rather by plumage than manners, and by dimension than conformation.

THE

B U T C H E R - B I R D S.

THE great Butcher-Bird is about as large as a thrush; is ash-coloured; its bill black, an inch long, and hooked, whereby, together with its carnivorous appetite, it ranks among rapacious birds; its legs and feet slender. The lesser Butcher-Bird is little above the size of a lark; the smallest not so big as a sparrow. Live as well on flesh as on insects, and thus partake, in some measure, of double qualities.

The most redoubtable birds of prey respect them; the kite, the buzzard, and the crow, seem rather to fear than seek an engagement. Nothing in nature better displays the respect paid to courage, than to see this little bird, apparently so contemptible, fly in company with the lanner, the falcon, and other tyrants of the air, without fearing their power, or avoiding their resentment. Small birds, which are its usual food, it seizes by the throat, and strangles in an instant. When it has killed a bird or insect, it is asserted that it fixes them on some neighbouring thorn, and, when thus spitted, pulls them to pieces with its bill. It is supposed, that as Nature has not given this bird strength sufficient to tear its prey to pieces with its feet (as hawks do) it has recourse to this expedient.

During summer, such of them as constantly reside here (for the smaller red butcher-bird migrates in autumn, and returns in spring) remain among the mountainous parts of the country; but in winter they descend into the plains. The larger kind nestle on the highest trees; the lesser build in bushes; lay about six eggs, white, encircled at the bigger end with a ring of brownish red. The female feeds her brood with caterpillars and other insects while very young; but soon accustoms them to flesh, which the male procures with surprising industry. The whole brood live in one family, generally composed of the male, female, and five or six young. It is easy to distinguish these birds at a distance, not only by their going in companies, but by their manner of flying, which is always up and down, seldom direct or sideways.

The woodchat is brown, and not red. There is still another, less than the former, found in the marshes near London; a bird of prey, though
not

not much bigger than a tit-mouse. Of foreign birds of this kind there are several varieties, whose manners are little known. The hot climates produce most, and among them one tufted.

O F T H E

O W L K I N D.

BIRDS of this kind have one common mark, by which they are distinguished: their eyes are formed for seeing better in the dusk than in sun-shine, whereby they are fitted for a life of nocturnal-depredation. In these birds the pupil is capable of opening very wide, or shutting very close; beside this, there is an irradiation on the back of the eye, and the iris has a faculty of reflecting the rays of light, to assist vision in gloomy places, where these birds frequent: but they do not see best in the darkest nights, but in the dusk of evening, or the grey of morning. When the moon shines is the time of their most successful plunder. The faculty of nocturnal vision is not alike in all: some see by night better than others; and some are so little dazzled by day-light, as to perceive their enemies. The white, or barn-owl, sees with such exquisite acuteness in the dark, that though the barn has been shut at night, and the light excluded, it perceives the smallest mouse that peeps from its hole; and the brown horn-owl is seen to prowl along the hedges by day, sometimes with success.

Owls may be divided into those with horns, and those without. The horns are two or three feathers that stand up on each side the head over the ear.

Of the horned kind is, the GREAT HORNED OWL, which appears as large as an eagle; but observed more closely is much less; his extent of wing about five feet: his horns are composed of feathers, that rise above two inches and a half, and which he can erect or depress at pleasure; his eyes are large and transparent, encircled with an orange-coloured iris; his ears large and deep, probably he possesses most exquisitely the sense of hearing; his plumage is reddish brown, marked on the back with black and yellow spots, on the belly yellow only.

The COMMON HORNED OWL is much smaller; his horns, about an inch long, consist of six feathers, variegated with black and yellow; his extent of wing about three feet. A smaller kind of horned owl is little larger than a black-bird, whose horns, remarkably short, are composed but of one feather, not above half an inch high.

To these succeeds the tribe without horns. The HOWLET is the largest of this kind, with dusky plumes, and black eyes; the SCREECH-OWL smaller, with blue eyes, and iron-grey plumage; the WHITE OWL, about equal in size, with yellow eyes and whitish plumage; the GREAT BROWN OWL, less, with brown plumage and a brown beak; and the LITTLE BROWN OWL, with yellowish-coloured eyes, and orange-coloured bill.

In proportion as one of these bears day-light best, he begins earlier in the evening his pursuit of prey. The cavern of a rock, a hollow tree, the battlements of a ruined castle, wherever is obscurity, there they retreat; if they be seen out of these in the day-time, they may be considered as wandering, and surrounded with danger. At the approach of evening they sally forth, and skim along the hedges; but the barn-owl, who lives chiefly upon mice, takes his residence upon some shock of corn, or the point of some old house; and there watches in the dark, with the utmost perspicacity and perseverance. They all have an hideous note, which has something terrifying in it; as in the silence of midnight, it breaks the general pause with a variation, alarming and disagreeable. The prejudices of mankind have united with their sensations to make the cry of the owl disagreeable, and the screech-owl's voice *was* considered among uninformed people as ominous, whereas it is his note of tenderness to his mate. While preying, they are silent.

When one is surprised by day-light, he takes shelter in the first tree or hedge that offers concealment, but often, with all his precaution is descried by the birds of the place. The smallest, the feeblest, the most contemptible of his enemies, are then foremost to torment him. They increase their cries and turbulence round him, and flap him with their wings. Astonished and dizzy, he only replies to their mockeries by awkward and ridiculous gestures, by turning his head, and stupidly rolling his eyes. An owl by day sets the whole grove in an uproar. Sometimes they hunt him till evening returns; but this restoring him his sight, those birds, which a few minutes before came to provoke their enemy, now fly him with terror, as lately they teased him with insolence.

O F T H E P O U L T R Y K I N D.

UNDER this class we may rank our cock, peacock, turkey, pintada or Guinea-hen, pheasant, bustard, grouse, partridge, and quail. These being granivorous, fleshy, and delicate, are among birds, what beasts of pasture are among quadrupeds. Their short wings are ill formed for wandering, and their short bills for offence; their legs are strong; but their toes made for scratching up, and not for holding or tearing; while their aptitude to fatness and flesh, renders them unwieldy, and almost local, incapable of straying far from each other. They are furnished with a very strong stomach (or gizzard); their voraciousness scarce knows any bounds; even in captivity, they enjoy the pleasure of eating; and soon grow fat and unwieldy.

Among the habits peculiar to this class of birds is that of dusting themselves, by lying flat in some dusty place, and with their wings and feet scattering the dust over their whole body. For what reason is not easy to explain, whether to destroy insects, or to prevent adhesion of their feathers.

T H E B U S T A R D

IS the largest land-bird native of Britain. The increased cultivation of the country, and the extreme delicacy of its flesh, has greatly thinned the species; notwithstanding it inhabits only the open plain, where its food is abundant, and where every invader may be seen at a distance.

The male weighs about twenty-five pounds (the female is about half the size: a remarkable difference). The neck is a foot long, the legs a foot and a half, covered with small scales; three toes on each foot; under the foot is a callous tubercle serving as a heel. The wings are nine feet from tip to tip; flies with great difficulty, but can continue several miles. The head and neck of the male are ash-coloured; the back

barred transversely with black and bright rust colour. The greater quill feathers are black; the belly white; the tail, consisting of twenty feathers, is marked with broad red and black bars, the legs dusky. The male (only) has a tuft of feathers, about five inches long, on each side the lower mandible. He (only) has also a pouch, whose entrance lies immediately under the tongue, capable of holding near seven quarts of water. This is probably filled upon proper occasions, to supply the hen when sitting, or the young before they can fly.

They haunt the plains, downs, heaths and uplands. Their food is corn, berries, and large earth-worms, whose moisture enables them to live on plains which furnish but little water. They swallow pebbles like the ostrich. They have always centinels placed at proper eminences, which warn the flock of the smallest appearance of danger. Are seldom shot, but often run down by greyhounds; having fed themselves so very fat, that they are unable to fly without great preparation, which gives an advantage to their pursuers.

They separate in pairs about the latter end of summer, if there be a sufficiency of females; if not, the males fight till one of them falls. The male *struts* around the female, and spreads his tail like a turkey-cock. They nestle on the ground, just scraping a hole in the earth, sometimes lining it with a little long grass or straw. Lay two eggs, the size of a goose-egg, pale olive brown, marked with darker spots. They hatch in about five weeks, and the young run about as soon as they are out of the shell. They assemble in flocks in October, and keep together till April.

There is a smaller bustard not half the size of this, being only eighteen inches long, but of the same manners. Found in France; is rare. Its flesh is brown, but excellent. Cunning to a proverb.

Mr. Pennant places the Stone-Curlew as a third of this kind.

In Arabia is a tufted bustard, called Lo-pong.

In Africa a bustard ash-coloured, and black; which has been mistakenly called a flying-ostrich.

In India, a small kind with longer legs, colours black, brown, and grey; inhabits Bengal.

THE TINAMOUS

PARTAKES much of the bustard and partridge. But whereas these European birds never perch on trees, those which resemble them in America perch; and even many of the web-footed kinds (which in Europe is never seen): for though they frequent the water in the day-time, they return to roost on trees at night. To this they are prompted by necessity, as well to avoid jaguars and beasts of prey, as serpents, and the innumerable hosts of insects which swarm in those countries. The ants alone compose immense columns, and would quickly devour any young birds they could envelope during their sleep: certain quails which live on the ground are often swallowed by serpents. Perhaps these quails are new-comers, and hereafter may improve in carefulness.

The tinamous is often called *partridge* by the colonists: but has a slender bill, long, soft at its extremity, black above, white below; nostrils oblong, placed toward the middle of the bill; the hind toes short; nails long, large, and hollow; feet scaly; wings short. They perch upon trees during night, sometimes during day; never seek great trees, or high branches. Are of white flesh, good to eat, feed on fruits, or coffee-berries. Scratch a hole for their nests, lay many eggs, fly heavily, but run swiftly; the female exceeds the male in size, which in Europe is peculiar to birds of prey. There are many varieties; one equal to a pheasant in size. They live in woods. A small kind nestles in trees among the low branches.

THE TURKEY,

WITH us, when young, is the tenderest of birds; yet wild, it is found in plenty among the forests of Canada, where they go in troops of hundreds: much larger than in their state of domesticity, and more beautiful; their feathers being dark grey, bordered on the edges with bright gold colour. The Indians hunt them with a dog, which, when they first discover, they leave far behind: he follows, sensible they must soon be tired, as they cannot go full speed long; and at last, forces them to take shelter in a tree, where they sit quite spent and fatigued, till the hunter comes up, and, with a long pole, knocks them down: if one is shot, the others never attempt an escape, or take warning.

Stupid, vain, querulous, yet without weapons. Every body knows the strange antipathy of the turkey-cock to red; how he swells, and, with his peculiar gobbling, flies to brave it. If the head of a turkey be smeared with dirt, the rest run to attack it with all speed. Two of them, thus disguised, will fight each other till almost suffocated with fatigue and anger. Weak and cowardly against other animals; there is none, how contemptible soever, that will boldly face the turkey-cock, but he will fly from: while, with the insolence of a bully, he pursues any that seems to fear him; yet sometimes they will defend themselves against vermin, as ferrets, &c.

The female seems milder. Hunts about in quest of grain and insects; is delighted with the eggs of ants and caterpillars. Lays eighteen or twenty eggs, larger than those of a hen, whitish, but marked with spots resembling freckles. Her young are extremely tender at first, and often have not strength to pierce the shell which includes them.

Some are white, others black and white; often white and brownish yellow.

Properly speaking, the turkey has two tails, one superior, the other inferior; the first composed of eighteen great feathers, which he can erect at pleasure, the other horizontal, as usual. The male has a spur on his leg. Some are tufted.

When grown up, turkies are hardy birds, bearing even exposure to the rigour of winter, and feed themselves at very little expence. Those of Norfolk are said to be the largest of this kingdom, weighing from twenty to thirty pounds. In the East Indies (where they are known only in their domestic state) they grow to the weight of sixty pounds. Abundant in the Antilles, where they breed three or four times a year.

T H E P E A C O C K.

WHEN this bird appears with its tail expanded, none of the feathered creation can vie with its beauty; but its horrid scream abates the pleasure of viewing it, while its gluttony and depredation render it a noxious domestic. Sheds its tail annually, and then conceals itself, as if ashamed. Is said to be very susceptible of flattery, and to spread

spread his tail if careſſed, but if contemned, to cloſe it. Is two years coming to maturity. Has a ſpur on each leg.

Peacocks were brought from the Eaſt-Indies: they are ſtill found in vaſt flocks; wild, in the iſlands of Java and Ceylon.

The peacock's fleſh keeps longer unputreſied than that of any other animal; even ſeveral years. The peacock feeds on corn, prefers barley. Is very proud and fickle; every kind of food it will at times cover and purſue; inſects and tender plants often. Though it flies heavily, walls cannot eaſily confine it; it ſtrips the tops of houſes of their tiles or thatch, lays waſte the labours of the gardener, roots up his choiceſt feeds, and nips his favourite flowers and buds.

He requires five females at leaſt; and if there be not a ſufficient number, he will even force the ſitting hen. For this reaſon, the pea-hen endeavours to hide her neſt. She ſits twenty or thirty days. She lays five or ſix eggs in this climate before ſhe ſits. Ariſtotle ſays twelve; and probably, in her native climate, ſhe may be more prolific: In India to twenty or thirty. The young do not ſhew their tufts till they are a month old: the cock does not acknowledge them till then, but drives them off. Being troubled with inſects, they ſcratch each other on the head.

There are varieties of this bird, ſome of which are white; yet retaining ſome marks of the *eyes* on their tail-feathers, others creſted: that which is called the peacock of Thibet, is the moſt beautiful of the feathered creation, containing in its plumage all the moſt vivid colours, red, blue, yellow, and green, diſpoſed in an almoſt artificial order, to pleaſe the eye.

THE HOCOS

ARE ſtrangers to Europe, and belong only to the hot climates of America. Their various names, as given by various tribes of Indians, have greatly augmented their ſeeming numbers: their real varieties are conſiderable.

The hocco is nearly the ſize of a turkey; diſtinguiſhed by a creſt, uſually black, ſometimes black and white, two or three inches high, reaching from the baſe of the bill to the back of the head: this the bird

can

can erect or depress at will: the crest is composed of narrow feathers inclining backward, but their points bending forward: among them are several inclosed in a kind of covering half their length. The reigning colour of the plumage is black velvety, sometimes speckled with white. Some have a yellow skin at the base of the bill, which includes the nostrils; this skin, extending on each side the head, surrounds the eyes; in others, it becomes a kind of knob on the base of the superior mandible. Peaceable, and even stupid, sociable, and domestic, easily tamed; though one wanders far in the day-time, he returns at evening, and knocks at the door for admission; pulls the servants by their clothes, when they forget him: follows his master every where. In his wild state, inhabits the mountains; feeds on fruits, perches on trees during night; flies heavily, walks boldly; his flesh is white, good eating, but rather dry.

THE PHEASANT

WAS brought into Europe from the banks of the Phasis, a river of Colchis, in Asia Minor; from whence their name; and are said to be first brought by the Argonauts in their famous expedition. These are still the finest known.

Next to the peacock, are the most beautiful of birds, as well for the vivid colour of their plumes, as for their happy mixtures and variety.

The iris is yellow, the eyes surrounded with scarlet, sprinkled with small specks of black. On the fore part of the head are blackish feathers mixed with shining purple. The top of the head and the upper part of the neck are tinged with a shining darkish green. In some, the top of the head is of a shining blue; the head, and upper part of the neck, appear either blue or green, as differently beheld by the spectator. The breast, shoulders, middle of the back, and the sides under the wings, have a blackish ground, with reflections, black or purple, according to different lights, under which is a transverse streak of gold colour. The tail, from the middle feathers to the root, is about eighteen inches; the legs, feet and toes, are dusky. On the legs are black spurs, shorter than those of a cock. A membrane larger than usual among the poultry kind connects the toes, as if advancing to the water-bird classes. The male is most beautiful. Its flesh is considered as the greatest dainty.

The

The pheasant has multiplied in its wild state, and, as if disdaining the protection of man, has taken shelter in woods and forests (not mountains), attached to its native freedom; and now wild among us ornaments our parks and plantations, where he feeds on acorns and berries. (In Italy, &c. frequents marshes.) This spirit of independance seems to attend the pheasant in captivity; and is so influential as to render him solitary. In the woods, the hen lays from eighteen to twenty eggs; in a domestic state, seldom above ten. Is particular in making her own nest, in coverts; when wild, she maintains her brood with patience, vigilance, and courage: when tame, she never sits well; and as for leading her young to their food, she is utterly ignorant where to find it, and they starve, if left solely to her. Sits twenty to twenty-five days.

They have no great sagacity, and are easily taken. At night they roost on the highest trees of the wood, head under the wing; by day they descend among the lower brakes and bushes. The female has scarce any voice; that of the male is between the peacock and the pintado, consequently far from melodious. When taken young into keeping, they become as familiar as chicken; when they are designed for breeding, they are put together in a yard, five hens to a cock. The young are very difficult to rear, and must be supplied with ant-eggs, which is their food when wild: insects make a variety. Lives six or seven years. From the common hen, coupled with the cock-pheasant (for the mixture is not barren), will be produced a species tamer, stronger, and more prolific. This is probably the cocquar, or bastard pheasant.

It is asserted by some, that such is the carnivorous disposition of this bird, that when several are in the same yard, if one sickens, or seems to be pining, the rest will destroy it.

There are white pheasants, black and white pheasants, crested pheasants, spotted pheasants; but of all others, the golden pheasant of China is the most beautiful; his plumage red, blue, and gold. He is smaller than the common. The iris, bill, and feet, yellow; his tail long, no red round his eyes. The female is at first but dull in her colours, but in a few years acquires all the brilliancy of the male.

There is also a horned pheasant, having two horny excrescences on the head, blue, cylindrous, obtuse, inclining backwards. No red round his eyes, but black hairy-looking feathers, somewhat of wattles under throat. His head red.

In America a bird not truly a pheasant, but representative of the species named *KATRACA*. China and Thibet furnish several birds allied to the pheasant, and to the peacock, without being truly either.

THE
PINTADA, OR GUINEA-HEN,

IN some measure unites the characteristics of the pheasant and the turkey. Has the delicate shape of one, and the bare head of the other; has been by Pliny called *bumped*, which, though it is not, it is round-backed. Is about the size of a common hen, but having longer legs, looks much larger. Has a round back, tail turned downwards. The head covered with a kind of casque; the plumage black or dark grey, pretty regularly speckled with white spots not unlike pearls; has wattles under the bill, which do not proceed from the lower chap (as in cocks), but from the upper, which gives it a peculiar air; while its restless gait and odd chuckling sound, often repeated, distinguish it from all other birds.

By some is called the Barbary-hen, by others, the Tamis bird, and by others, the bird of Numidia. We have named it from that part of Africa, whence probably it was first brought to us.

In their native country, are seen in vast flocks in quest of food. Their habits are like those of the poultry-kind. The male and female are so alike, that they can hardly be distinguished. The only difference lies in the wattles, which in the cock are bluish; in the hen, more inclining to red. Their eggs are speckled: in our climate, they lay but five or six in a season: but are far more prolific at home, where they will lay a hundred and fifty by proper treatment. They are kept among us rather for shew, as their flesh is little esteemed, and as they are troublesome to rear.

There are many varieties; some quite white, some with red combs, some bluish; some with white bands on the breast. Is a quarrelsome bird, of a strong bill, and weak head. Those of St. Domingo often frequent the marshes.

Mr. Buffon thinks they rather resemble upon the whole the partridge than the pheasant. Most authors affirm that they little regard their brood. They live on grain and insects. This bird being African, has had many names: formerly some Mahometans sold them very dear to the Christians, under the name of the Jerusalem bird; but the fraud being discovered, these resold them to other good Mussulmen at an extravagant rate, under the title of Mecca hens.

T H E C O C K.

THE cock seems the oldest companion of mankind, and first reclaimed from the forest; in consequence, perhaps, he exhibits the greatest varieties; there being scarce two birds of this species completely alike. The tail, which ornaments the generality of these birds, is wanting in some; and not only the tail but the rump. The toes, which are usually four in the poultry kind, yet in a species of the cock are five. The feathers, which lie so orderly and sleek in most, in a peculiar breed are inverted, and stand the wrong way: a species from Japan, instead of feathers seems covered with hair. Some have feathers to the feet, some even to the claws. The cock was one of the foods forbidden among the ancient Britons.

The cock is found wild in the island of Tinian, in others of the Indian Ocean, and in the woods on the coast of Malabar. Here his plumage is black and yellow; his comb and wattles yellow and purple. The bones of those of the Indian woods, of the Philippine Islands, and of St. Jago, when boiled, are black. Probably this tincture proceeds from their food.

His wings being short, he rarely flies, crows indifferently night or day. Some hens crow, but feebly. Drinks by raising his head and swallowing; sleeps often standing on one leg, and hiding his head under his wing. On his head a comb, under his chin wattles, which are a double membrane. His claws, when four, are three before and one behind; when five, two behind. His feathers are remarkable, by growing in pairs from the flesh. His tail has fourteen feathers divided into two parts, uniting at the top. On his legs, spurs. He is very watchful and fond of his hens, and jealous also.

No animal has greater courage than the cock when opposed to one of his own species. In China, India, the Philippine Islands, and all over the east, cock-fighting is the sport of kings and princes. With us it is declining daily.

A single cock suffices for ten or a dozen hens. But he soon grows old. Hens also, as they for the greatest part of the year daily lay eggs (in Samogitia, Malacca, and elsewhere, twice a day; in Illyria, says Aristotle, three times), for the most part after three years become effete and barren: for when they have exhausted all their seed-eggs, of which they had but a certain quantity from the beginning, they must necessarily cease to lay, there being no new ones generated within.

The hen seldom clutches a brood of chicken above once a season. Will lay in a year above two hundred eggs, provided she be well fed and supplied with water and liberty. Her nest is merely a hole scratched into the ground among a few bushes.

If left to herself, the hen would seldom lay above twenty eggs, without attempting to hatch: but while her eggs are removed, she continues to lay. In the wild state, the hen seldom lays above fifteen eggs. Nothing can exceed the perseverance and patience of the sitting hen; she continues for some days immovable, forgetting even food; yet does not know her own eggs, or brood, but rears ducklings, even though they be water-fowl. She carefully turns her eggs, and removes them to different situations; in about three weeks, the young give signs of a desire to burst their confinement. When, by the repeated efforts of their bills, they have broke the shell, she continues sitting till all are excluded; then leads them forth to provide for themselves: abstains from all food that they can swallow; flies boldly at every invader, and even sometimes surprises birds of prey into flight by unexpected resistance; acts the commander, and by variety of notes calls her train to their food, or warns them of approaching danger.

Ten or twelve chicken are the greatest number a good hen can rear and clutch; but by the artificial method of hatching chicken in stoves, as is practised at Grand Cairo, they produce thousands. In our colder climate, the little animal may equally be hatched, but few reach maturity.

A capon may easily be taught to clutch chicken by gradually introducing them to his acquaintance.

Chymists say, the products of the flesh of a cock and a capon are not alike; capons do not moult, nor crow distinctly; but eat, sleep, and fatten.

An experiment has been tried on young cocks, by *grafting* a spur into their comb, which has taken root and grown to the length of two inches and a half, assuming the appearance of a horn.

The species is spread throughout the world; was introduced into America from Europe. Some are tufted, their comb is usually small. The Madagascar cock is extremely small, the eggs very diminutive, since the hen often hatches thirty. The Java and Bantam breeds are very small. Some are so short-legged their wings trail on the ground. The frizzled breed, whose feathers stand up, are supposed to be natives of Asia. The Padua cock is extremely large, and has a double comb and a crest.

The Agami

T H E
C O C K O F T H E R O C K S,

THOUGH of a uniform colour, is yet among the handsomest of America, because his colour and plumage are beautiful. Eats fruits, perhaps for want of grain. He resembles the cock, but differs by the form of his toes, which are united by a membrane; the first and second toes to the third articulation; the second toe to the third, only to the first joint. His bill is compressed on the sides toward the extremity; tail short and square; as also several feathers of his wings. His principal distinction is his crest, which is placed longitudinally on his head, in the form of a semicircle. This crest is not single, but double, formed of two planes inclined to each other, and meeting at the summit. The male is a beautiful red, the female brown. She has a crest, but less full, less elevated, less rounded, and further advancing on the bill than the male's. About the size of a pigeon. The young male is brown, like the female; becomes red by time. Inhabits deep chasms among rocks, and dark caverns; sees and flies during day, but more and better by twilight. They are very wild, can only be shot; and that after great patience. Their flight rapid, but short: they scratch the ground and beat their wings like the cock, but do not crow; their only cry resembles the syllable *ke*. Wild among rocks, in a slight nest, made of dry wood, lay two eggs, the size of pigeon's. The males quit their caverns oftener than the females, which are rarely seen. May be tamed. There is a variety in Peru, which has a long tail; has black about his plumage; his crest less complete. These might be thought the representatives of our poultry in America; but that there are others, which, though less, resemble them closer by the comb and tail, as well as general figure.

T H E A G A M I

INHABITS mountains and high woods, like the partridge, and pheasant: is about two feet long; his bill resembles the cock kind; his tail short, not beyond the wings when closed, but overshot by the

back feathers; legs five inches, scaly; head, throat, and neck downy; the front of the neck splendid; the back, and back of the neck black; the lower part of the back brownish-red; the rest black, as also the wings and tail; the legs greenish.

This bird is singular, by its power of making a noise, dull and deep, not unlike the cooing of pigeons; which has always been thought to proceed from the anus, but which rather may be supposed to be a particular motion of the lungs, whose sound is heard through the flesh: this *tooo tooo* he repeats several times, and often, when urged by the imitation of it by by-standers.

Are cleanly birds, dress their feathers with their bills, leap and beat their wings freely. Eat grain, little fish, bread, &c. Attach themselves like a dog to a master, and distinguish him, leap upon, to salute him, *trumpeting* (as some call it); runs to meet him when returning home; at home caresses him, and if he supposes a rival, drives him off; will peck the negro servants on the legs, when they approach his master; obeys the voice of his master; loves to be stroked and scratched on his head and neck; comes to table without being called; drives off all the cats and dogs before he begins to eat; never runs away, but avoids the blows of his adversaries by flying up, and falling on them. May be taught like a dog to guard, and to guide a flock of sheep. Follows his master out of town, and returns with him. They often follow somebody to whom they take a liking, will seek and find him out, and wait at a door two or three hours till he comes out; run if he runs, and stop if he stops. Some will attend strangers into the garden of a house, and walk with them in every turn and alley.

When wild, go in troops from ten to forty, fly little, but run much, and swiftly. Nestle at the foot of some great tree, where they make a hole, but no nest: lay ten to sixteen eggs: the young keep their first down longer than chicken, &c. till sometimes it is two inches long, and they seem like beasts covered with hair. The young are not bad eating, the old ones dry.

THE
GROUS, AND ITS AFFINITIES.

THE Cock of the Wood, or larger Grouse, resembles a cock in form, in bill, in the red skin over his eyes, and in the singularity of his feathers which grow two together; but has neither wattles nor spurs. His legs are feathered, and his toes somewhat indented. His tail is expansible like the turkey's.

Is chiefly fond of a mountainous and wooded situation, in temperate climates; but in Hudson's Bay he prefers the plains. In winter he resides in the darkest recesses of the woods; in summer he ventures from his retreats, to make short depredations on the farmer's corn. As he is greatly sought after, he is always on his guard, and seldom surprised. Those who would take him, must venture up to his native retreats. When in the forest, attaches himself principally to the oak and the pine-trees; the cones of the latter serving for his food, and the thick boughs for an habitation. Sometimes will strip one tree of its cones, before he will deign to touch those of another. Feeds also on cranberries, and ants' eggs, which seem a high delicacy to all birds of the poultry kind.

During February, March and April, this bird is seen at sun-rise and sun-set, extremely active, on one of the largest branches of a pine-tree. His tail raised and expanded; his wings lowered; he walks backward and forward, his neck stretched out, his head swollen and red, and making a thousand ridiculous postures: his cry, upon that occasion, is a kind of loud explosion, which is instantly followed by a noise like the whetting of a scythe, which ceases and commences alternately for about an hour, and is then terminated by the same explosion. All this time, the bird seems deaf and insensible; even though fired at, he continues his call; and this is the opportunity sportsmen generally take to shoot him. At all other times, he is timorous and watchful; but now he seems entirely absorbed by his instincts. This extraordinary cry, which is accompanied by a clapping of the wings, is no sooner finished, than the females hearing it, reply, approach, and place themselves under the tree, from whence the cock descends. One cock will engross the females of a considerable district.

The female is much less than her mate, and entirely differs in plumage, so that she might be mistaken for a bird of another species: lays six to nine

nine eggs, white, marked with yellow; larger than a common hen's egg: she generally lays them in a dry place and a mossy ground, and hatches them without the company of the cock. When she is obliged, during the time of incubation, to leave her eggs in quest of food, she covers them up so artfully, with moss or dry leaves, that it is extremely difficult to discover them. She often keeps to her nest, though strangers attempt to drag her away.

As soon as the young are hatched, they run after their mother, though sometimes not entirely disengaged from the shell. The hen leads them into the woods. They are hardy, and their food is plentiful; but their numbers are thinned by rapacious birds and beasts of every kind; and still more by their own contests. The brood follows the mother a month or two; at the end of which the young males entirely forsake her, and keep in harmony together till the beginning of spring: then they consider each other as rivals: they fight like game-cocks; and are so inattentive to their own safety, that often two or three are killed at a shot.

The **BLACK COCK**, is greatly similar to the foregoing in form and manners; but is much smaller, not weighing above four pounds; is almost black (the hen grey); and has a kind of forked tail, flat, and divided in the middle, the ends turning outward. They deepen in blackness gradually; and gradually acquire, as they become old, a number of white spots on their tail. Sometimes eats scarce any thing during two or three months in winter.

There is also a black cock, whose tail is not divided, but full.

Another kind, native of Courland, changes colours with the season. Male and female are alike; do not perch upon trees.

Of much the same general habits are the **RED COCK** of Scotland, that of the Alps, and the Ptarmigan: all may be known by the scarlet-skin above the eyes.

T H E

PARTRIDGE, AND ITS VARIETIES.

OF Partridges are two kinds; the grey and the red. The red is the largest of the two, and often perches on trees; the grey, which is common in England, is most prolific, and always keeps on the ground.

Is found in every country, and in every climate; seems to adapt itself

horny excrescences equal in dimensions: these birds are the size of a turkey-hen. We shall describe one which may convey a good idea of the whole kind.

He was the size of a raven, about two feet and a half long from bill to tail; his bill eight inches long, two inches wide, a little curved: a kind of second bill surmounted the first, following its course; this reached to within two inches of the point of the bill, rising two inches and a quarter; the height of bill, and excrescence together (in the middle), full four inches; this excrescence has much the look of a second bill, but closed, yet shewing a mark where it might almost be thought to open, running down the midst of it; this does not join the cranium, but a kind of forehead void of feathers, covered with a skin, through which passes the nourishment of this false beak. The true bill terminates in a blunt point, is of a horny substance, almost osseous; the false bill very thin, and yielding to the fingers, is within cellulated like a honey-comb, is black at its termination, has a black line at its origin, as also at the root of the true bill, the rest yellowish white; the interior of the bill and palate black; at its root is a white folded skin on each side. The eye is red-brown; the head resembles that of the jay. In general, the appearance of this calao was a mixture of the jay, the pie, and the raven. His head and neck were black; he could elevate his tuft like the jay. His back and wings black, with feeble reflections of violet and green; on some of his wing-feathers irregular borders of brown; the stomach and belly dirty white; feet black, thick and scaly; nails long, but not sharp. Leaped with both feet without walking, like the jay and pie; when reposed held his head backward. Eat flesh as well as fruits; incapable of bearing cold. The whole tribe are ignoble, and some filthy, living on carrion; yet they are kept by the Indians to chase rats and mice, which they swallow whole, for they cannot tear or divide with their bill.

As the bill is the most remarkable distinction of this bird, as also of the Toucan, he may properly be followed by that bird.

THE TOUCAN

IS about the size of, and shaped like, a jack-daw, with a large head; its bill, from the angles of the mouth to its point, is six inches and an half; its breadth, in the thickest part, exceeds two; its thickness near the head is one inch and a quarter; it is a little rounded

along the top of the upper chap, the under-side being round also; the whole bill extremely slight, and little thicker than parchment. The upper chap is of a bright yellow, except on each side, which is a fine scarlet; as is also the lower chap, except at the base, which is purple. Between the head and the bill is a black line of separation all round the base of the bill; in the upper part of which the nostrils are placed, and are almost covered with feathers. Round the eyes, on each side the head, is a space of bluish skin, void of feathers, above which the head is black, except a white spot on each side joining to the base of the upper chap. The hinder part of the neck, the back, wings, tail, belly, and thighs, are black. The under side of the head, throat, and the beginning of the breast, white. Between the white on the breast, and the black on the belly, is a space of red feathers, in the form of a new moon, with its horns upwards. The legs, feet and claws, are of an ash-colour; and the toes stand like those of parrots, two before, and two behind.

Is harmless and gentle, easily made tame, even to sit and hatch in houses. Feeds chiefly on pepper, which it devours greedily, gorging itself so much, that it voids it crude and uncooked: and this the natives prefer. Grapes, being plucked off singly, and thrown into the air, it will dexterously catch before they fall to the ground. Its bill being very light, and so thin, as easily to bend by a slight pressure with the fingers, has little strength, nor can it peck or strike smartly therewith. Its tongue seems to assist its efforts; is long, thin and flat, and often extends five or six inches from the bill; of a flesh colour, remarkably fringed on each side with very small filaments, exactly resembling a feather; and is said to be truly a feather.

Builds its nest in holes of trees, which have been previously scooped by some stronger bill; lays two eggs, leaving only a hole large enough to go in and out at. There it sits, with its great beak, guarding the entrance. Found in the warm climates of South America, where it is in great request, for the delicacy of its flesh, and the beauty of its plumage. Is erratic, go in troops of eight or ten, fly badly, frequent marshes where the softer fruits grow; though lively they seem heavy, and though active awkward, because of the prodigious overbalance of their bill. They are so fearful of cold, that they make a kind of warm bed of herbs, &c. for the nights, in the hottest climates. There are several varieties.

The ARACARI is a toucan, smaller, of less beak, and its substance harder.

OF THE MAGPIE AND ITS AFFINITIES.

THE MAGPIE is the chief of this kind with us, and is well known. Its black, white, green and purple, the rich and gilded combination of glosses on its tail, equal any that adorn the most beautiful of the feathered tribe; but it is vain, restless, loud, quarrelsome, intrusive, and mischievous.

The magpie resembles the butcher-bird in its bill, which has a sharp process near the end of the upper chap, in shortness of wing, and form of tail, each feather shortening from the two middlemost; still more in its food, living not only on worms and insects, but on small birds when they can be seized; a wounded lark, a young chicken separated from the hen, and sometimes a black-bird: has been seen to attempt a crab, whose pincers were however too sharp for it. Is capable of being trained for the chase, easily becomes familiar, and even imperative; has been known to pass days and nights among a troop of cats, and to make its part good. Is capable of being taught to speak, and takes pleasure in it; studies its words, rejoices after the acquisition of new ones, and is vexed when they are too difficult. Often perches on the back of an ox or a sheep, pecking up insects, chattering, and stretching out its neck for combat; seeks out also the nests of birds. Nothing seems amiss; it shares with ravens in their carrion, with rooks in their grain, with the cuckoo in eggs; and when it is satisfied for the present, lays up the remainder. Even when tame will hide its food when filled, and after a time return to its hoard with renewed appetite and vociferation.

Its nest is not less remarkable for artful construction, than for security of situation. The place is always difficult of access. The body of the nest is composed of hawthorn branches; the thorns sticking outward, but well united by mutual insertions. It is lined with fibrous roots, wool, and long grass, and nicely plaistered with mud and clay. A canopy defends it above, composed of the sharpest thorns wove together, and denying all entrance except at the door, which is just large enough to permit egress and regress to the owners. The magpie lays six or seven eggs, of a pale green colour, spotted with brown. Watches its nest very closely, and defends it valiantly. If it observes a man has handled its eggs, transports them elsewhere in its claws for safety. The young are blind, and barely perfect; the mother maintains them with much tenderness. Lives twenty years.

The fowlers say, that if she observes a man enter a hut at the foot of the tree where her nest is, she will not visit her nest till he is gone. If two enter the hut, she watches both out; the same for three, or four; if six enter, and five come out, she is contented, and forgets the sixth.

To this tribe we may refer the JAY, which is one of the most beautiful of the British birds. The forehead is white, streaked with black; the head is covered with very long feathers, which it can erect into a crest at pleasure; the whole neck, back, breast, and belly, are of a faint purple, dashed with grey; the wings are most beautifully barred with a lovely blue, black, and white; the tail is black, and the feet of a pale brown. Feeds upon fruits, will kill small birds, and is extremely docile. Very petulant, lively, and quarrelsome, even to forgetting self-security; for they will fight over branches, and sometimes are strangled by being caught by the throat between two. In cages they beat themselves to pieces. Nestle in woods far from habitations, preferring old oaks grown over with ivy. Often, in attempting to steal birds caught in snares, are themselves caught. There is a white jay which yet retains the blue on his wings. The Rind is spread in distant parts.

The CHATTERER, native of Germany, may be placed in this rank; is a wandering bird; sometimes in such numbers as to darken the sun; is somewhat less than the former; is tufted, and variegated with a beautiful mixture of colours; red, ash-colour, chestnut, and yellow: but what distinguishes it are horny appendages at the tips of seven, sometimes eight (or more) of the lesser quill-feathers, which stand bare of beards, and have the colour and gloss of the best red sealing wax. Feeds on berries and grapes; is very cleanly.

The ROLLER is not less beautiful. The breast and belly blue; the head green; the wings variegated with blue, black, and white. Is distinguished by a sort of naked tubercles or warts near the eyes. Is a bird of passage, somewhat rare; inhabits Germany; dwells in thick woods; is quite wild; feeds on grain, &c. are good eating in autumn. The Arabian *Shaga-rag*.

The NUTCRACKER is a German bird, living on the mountains, and whose manners are little known; there are two races. They do much mischief among the trees, and lodge in them like the woodpecker. Every fifteen or twenty years come in flocks, or rather armies (like the Leming of Lapland), and devour much of the harvest.

WOODPECKER AND ITS AFFINITIES.

LIVE chiefly on insects contained in the bodies of trees; for this purpose have straight, hard, strong, angular, sharp bills, fit for piercing and boring. Tongue long, round, sharp; dentated legs, short and strong; four thick, strong, nervous toes, standing two forward, and two backward; one of which is remarkably strong; all have very strong and crooked nails, which are particularly serviceable in holding by branches of trees. They have stiff hard tails, to lean upon when climbing; the feathers of which end more or less *sharply*, and which contribute to *fix* them; for they often pass a whole night in the attitude of striking, and sleep while so situated.

Of this bird there are many kinds, and many varieties in every part of the world. They differ in size, colour, and appearance; the largest equal a crow, the smallest a thrush. Are most numerous in warm climates.

The Green Woodspite, or Woodpecker, is called the Rain Fowl in some parts of the country; because, when it makes a greater noise than ordinary, it is supposed to foretel rain (the ancients thought it ominous). Is about the size of a jay; the throat, breast and belly are of a pale greenish colour; the back, neck, and covert feathers of the wings green. The tongue is its distinguishing characteristic.

Feeds on insects; particularly on those which lodge in hollow or rotten trees. These it procures by its tongue. This is round, ending in a stiff, sharp, bony tip, dentated on both sides, like the beard of an arrow; this it can dart three or four inches out from the bill, and draw in again at pleasure. Thus its prey is transfixed, and drawn into the mouth. When a wood-pecker has found a rotten hollow tree where there are worms, resting by its strong claws, and leaning on the thick feathers of its tail, it begins to bore with its sharp strong beak, till it discloses the internal habitation; then it sends forth a loud cry, which terrifies the whole colony; while they creep hither and thither, seeking safety, the bird feasts on the whole brood. Sometimes alights on the ground, to try its fortune at an ant-hill, which it pecks, in order to call the inhabitants abroad; then thrusts out its long red tongue, which being like a
worm,

worm, the ants come out to settle on in great numbers: the bird withdraws its tongue at a jerk, and devours the devourers.

The woodpecker chooses, however, for its nest, trees that are decayed, or wood that is soft. In these, it makes deep holes exactly round, but often makes twenty before one is found to give satisfaction. Of those it deserts, other birds, not so good borers, and less delicate, take possession; the jay and the starling often, and sometimes bats. Its eggs are deposited in the hole, without any thing to keep them warm, except the heat of the parent's body. Their number is generally five or six; white, oblong, and of a middle size. When the young are excluded, and before they leave the nest, they are adorned with a scarlet plumage under the throat, which adds to their beauty.

THE CREEPERS

ARE a numerous family, spread in various parts of the world, which creep along the trees, upwards or downwards; and along the branches, over them or under them; they also run very nimbly along beams, &c. in houses. Many of them resemble the titlarks; others the colibris, by their beautiful plumage. They live intirely on insects, but are unable to bore for their prey as the woodpecker does; they follow, therefore, those who are able to pierce the wood, and take the prey they meant for themselves; or are content with such insects as wander from their retreats, which, in the warmer climates especially, are not a few.

The creeper is about the size of a wren, extremely active and mobile; inhabits the hole of a tree, whence he issues to strike the insects of the bark and moss. Here she breeds; lays five to seven eggs.

The WALLCREEPER inhabits walls; there lodges, creeps, and lays. Inhabits rocks also, and church-yards; flies, ants, and especially spiders, are their food.

At the Cape of Good Hope, the Dutch maintain many of the creeper kind, by giving them sugared water: the flies, &c. (which are the plague of the inhabitants) supply the rest; they die if fed on any other food than insects.

THE HOOPOE.

THE HOOPOE is distinguished by a double aigrette, or crest, which is almost peculiar to himself (or resembled only by the Cockatoo), by his long bill, thin and curved, and his short feet; about equal to the thrush in size; belongs to the old continent. One of these birds, taken when full grown, became so attached to its keeper, as to be jealous of the presence of strangers, and to set up his tuft; was always with his mistress, could not bear separation, nor was he desirous of liberty. Was so fond of music, as to stand on the harpsichord so long as his mistress played. Eats insects; follows the course of the Nile in Egypt for this purpose; in Europe are birds of passage; nestle in the holes of trees, or in walls; their nests filthy, lay two to seven eggs.

THE PROMEROPS

GREATLY resembles the Hoopoe; has no crest, but two frizzled tufts of feathers on each side the body, composed of nine long feathers, which are capable of elevation, as are also some of the scapular feathers, which, when raised together, assume the form of a fan; these being ornamented with brilliant green, and changeable blue and violet, give a sort of garland-like appearance to the wings. From these frizzled feathers, originate on each side a dozen or fifteen long feathers, which have the same reflections. The head and belly are green, the rest chiefly black; bill and feet black; tail very long. One species is orange-coloured.

THE BEE-EATERS

ARE so named from their food; not that they eat only bees, for they devour wasps, and other flying insects, which they chase much like swallows. The children in the isle of Candia use such insects for baits for them, and *fish* for them by lines hung in the air, on precisely the same principles as baits are used for fish; the bee-eater swallows the insect, and is caught by the hook. Sometimes eat grain; they perch on fruit trees, and dart on their prey; lay in holes, which, with their strong and short

feet, and iron bills (as the Sicilians call them), they make six feet deep in soft ground. About the size of a thrush. The kinds are numerous.

THE FLY-CATCHERS

ARE among the most useful birds of prey; for such they truly are, as they live only on insects. This kind is extremely numerous in species and varieties. The larger are equal in size to the butcher-bird, the smallest to the black-bird. They have a strong bill, almost triangular (surrounded with *whiskers*), and little hooked, in some kinds, at the end; in the larger kinds considerably bent; tail long. Wild and solitary; they inhabit great trees; rarely descend to the ground. The climates of the south, where the insects abound, are their true countries. Only two kinds known in Europe; but in Africa we count eight, and in America thirty; where also are the larger kinds.

The European fly-catcher is under six inches long, plumage grey, white, and deepish ash-colour; comes in April, goes away in September. Lives in woods; wild and stupid; build their nests exposed. In America some of the kinds are but the size of a wren; others are powerful birds.

Without the assistance of these birds, diminutive as some may seem, every endeavour would be vain to overcome and drive away the clouds of flying insects which are a perpetual annoyance; they are too numerous to be destroyed; are constantly stinging men and cattle, devour the productions of the ground; infect, by their excrements or their eggs, all provisions, &c. intended for stores; no candle can be lighted, but their numbers extinguish it; no sleep can be obtained without the utmost care to exclude them, which often is insufficient. To these birds, therefore, we are under great obligations; and nature has encreased the devourers, where she has multiplied their prey.

THE ANT-EATERS

FORM a remarkable class of birds: they abound in the humid and low countries of South America, where insects and reptiles, by their numbers, tyrannize over all other species of creatures.

In Guyana and Brasil, the ant-hills are the size of hay-stacks, and at least

least as populous as our own ant-hills; nor are these hills rare, but exceed ours in number, as in bulk, perhaps an hundred to one.

To prevent the total devastation which these animals might create, nature has appointed not only quadrupeds, but birds, to lessen their numbers. These birds are not totally unlike our black-birds in figure, but have short tails and wings; they perch but little, but run on the ground like partridges; go in troops; are generally found on ant-hills twenty feet high; are of a larger and smaller species, but greatly alike; keep in woods. The largest of the kind has been named King of the Ant-eaters, because there is seldom more than one of this kind among a troop of others, which he seems to avoid from dignity; is less lively than the others; the female (as throughout the species) larger than the male.

That called the Bésroi, though in size but six inches, has a voice (which he exerts morning and evening) as strong as a bell sounding the alarm, and may be heard at above a mile distance. The *strokes* follow rapidly, for an hour together, in all seasons.

That called the Chimer (*carrillonneur*) generally goes in companies of four or six: their clamour has exactly the effect of a set of three bells chiming alternately; their voice is loud, but not equal to the foregoing: whether each has three tones, or there are different tones of voice among them, is uncertain.

THE WRY-NECK

IS a bird, whose singular manners merit attention, and are justly expressed by his name: he is distinguished by a habit of turning and twisting his neck, bringing his head over his back, and half shutting his eyes; this movement is not rapid, but slow and gradual; it seems to be the effect of affright and astonishment at the sight of an object whose novelty surprises him, or to be an attempt at self-defence when he is seized; yet, as the young in the nest have the same habit, it may rather be thought a consequence of some natural conformation. One of these birds taken and caged, when visited, looks steadily at the spectator, then raising himself on his feet, pokes himself slowly forward, elevating the feathers on the crown of his head, spreading his tail; then suddenly withdrawing himself, strikes with his bill the bottom of his cage, and depresses his tuft; this he repeats an hundred times running. Upon these

these oddities, superstition adopted this bird in enchantments, and prescribed it as the most powerful of philtres; but where any analogy of causes and effects could be suggested, is utterly inconceivable. The wry-neck is not numerous; comes over in May, returns in September; is solitary; feeds on the ground; is the size of a lark; plumage grey, black, and tan-colour, waved and banded, producing a rich effect, not unlike a snipe's, eats ants like the woodpecker.

The strange motion of her neck has often protected her nest; for it resembles so strongly that of a serpent, that many a bird-nester has refrained from plunder, terrified by this supposed dangerous menace.

THE ANIS

ARE birds of manners so social, that they not only fly in flocks, but several females sit and hatch on the same nest. They have many nick-names, as Devil's-bird, Tobacco-stalk, &c. in the West Indies.

They have two toes before, two behind, short bills crooked, thicker than large; the inferior mandible straight, the superior semi-circular, hooked at the end. About the size of a thrush; some larger; colour, black, or deep brown-black.

The nest is made large; constructed of dry sticks and twigs, so as to hold five or six birds, and enlarged according to the number of sitters, sometimes to eighteen inches wide. They build together, breed together, fly together, perch together as close as possible, whistle together, and feed together; eat grain, also reptiles and insects. They fly badly, and hurricanes often destroy numbers: if their eggs are mixed, they hatch each one the others', nor do they refuse sustenance to their neighbours young; cover their eggs with leaves; and often one sits while the others are building around her. Are not eatable.

THE OX-PECKER

IS a small bird, about the size of a lark; of a grey-brown colour, which is very fond of the *larvæ* of certain insects which breed under the epidermis (or upper skin) of oxen, and which live there till their change. He stands on the back of the animal, and, by striking with his bill, opens the place where the insects are whereon he feeds. Inhabits hot climates.

IN the forests of hot countries, among the first strange objects that excite curiosity, is the multitude of birds' nests hanging at the extremity of almost every branch. Many kinds of birds build in this manner; but as the chief of them are of the woodpecker kind, we shall here describe the most remarkable. In these solitary forests, man is but seldom seen; the little bird has therefore nothing to apprehend from man; but is satisfied if its nest be out of the reach of those rapacious animals that live by robbery and surprise. The monkey and the snake *must* be guarded against, the bird has no other enemies to fear.

On one of these immense trees, is seen the most various, and the most inimical assemblage of creatures that can be imagined. The top is inhabited by monkies of some particular tribe, that drive off all others; lower down twine about the great trunk numbers of the largest snakes, patiently waiting till some unwary animal comes within reach; and at the extremes of the branches hang nests in great abundance.

The CAROUGE of the West Indies makes it of a kind of moss, called by the English inhabitants of these countries *old man's beard*. It is fibrous, not unlike horse-hair, which bears being moulded into any form, and suffers being glued together. This, therefore, the bird first glues by some viscous substance, to the extreme branch of a tree; then building downward, the nest depends in security.

The TOUCNAM-COURVI of the Philippine islands builds its nest of little fibres interlaced together, so as to form a kind of bag, open on one side; to this opening is adapted a long funnel, or tube, composed of the same kind of fibres, hanging down, and opening below, so that the true entry to the nest is not seen; these nests are hung at the end of branches.

The BLAGAFECHE is an Abyssinian bird, which rolls its nest spirally, much like the shell of a nautilus; he hangs it at the end of a branch, almost always over a standing water; the entrance is always turned *from* the rainy quarter, thereby guarding against wet, as well as enemies. To attain the same advantages, the GROSS-BEAK of Abyssinia makes his nest pyramidal, turns its opening from the rainy quarter, and also divides the cavity of the pyramid by a partition, forming, as it were, two chambers; the first, where is the entry; then he descends *under* his division into the second, where is the nest; so that let the rain or wind be ever so violent, it cannot reach the eggs.

Some birds glue their nest to the leaf of the banana-tree, which makes two sides of their little habitation; while the other two are artificially composed by their own industry. Thus their nests hang before the spoilers a temptation, but beyond their acquisition.

BIRD OF PARADISE AND ITS VARIETIES.

THIS bird appears as large as a pigeon, though in reality the size of a thrush. The tail is about six inches; as is the body; the wings are large, compared with the bird's dimensions. The head, throat, and neck are velvettèd pale gold colour; eyes small; the base of the bill, and the side of the head and throat, are surrounded by black feathers, soft as velvet, and changeable by a varied incidence of light; the hinder part of the head is shining green, mixed with gold; the body and wings are chiefly covered with beautiful brown, purple, and gold feathers; the feet long and strong; the upper part of the tail feathers are pale yellow, those under them white, and longer than the upper, for which reason the hinder part of the tail appears all white; but what is most remarkable are two long naked feathers, which spring from the upper part of the rump above the tail, and which are usually three feet long; these are bearded only at the beginning and the end; the shaft for two feet nine inches being a deep black, while the feathered extremity exhibits changeable colours, and an ornament something like the eyes of a peacock's tail. Black is the principal colour of some kinds.

This bird, whose beauty is superlative, is native of the Molucca Islands, but found in greatest numbers in that of Aro, in whose delightful and spicy woods they fly in large flocks. The inhabitants give them the name of God's birds (*Manucodiata*). At night all generally perch upon the same tree. They are called by some Swallows of Ternate, from their rapid flight, and from being continually on the wing in pursuit of insects. In the rainy season, it is said they fly to other countries where their food is in greater abundance; they have their stated times of return. In August, they are seen in great numbers flying together.

The natives, who make a trade of killing these birds and selling them to the Europeans, having concealed themselves in a bower made of the branches of the trees they frequent, shoot the birds with arrows of reeds.

There is also a *Manucodia* which has six long feathers issuing from his head, like those of others from the tail; a kind of crest from the bill; the feathers on the belly are four inches long.

N. B. The natives cut off the legs of many birds they sell, and say they have none.

THE

CUCKOO AND ITS VARIETIES.

THIS singular bird is somewhat less than a-pigeon, shaped like a magpie, of a greyish colour, distinguished by its round prominent nostrils; the opening of its bill large; its claws two behind, two before; legs short, tail long. It discovers itself early in the spring by its call, which is at first very weak, and earlier or later as the season seems to be more or less inviting. The call of the cuckoo, as summer advances, improves both in frequency and loudness. This invitation is used only by the male, who, perched upon some dead tree, or bare bough, repeats his song, which he loses as soon as the genial season is over. His note is pleasant, though uniform; and seldom occurs to memory, without reminding us of the sweets of summer.

The female makes no nest of her own, but sometimes lays in holes of rocks; much oftener she invades the property of some other bird, the water-wagtail, hedge-sparrow, lark, or stock-dove, and about twenty different birds; and often, after devouring the eggs of the owner, lays her own in their place. She usually lays but one (rarely two in the same place), which is speckled, and of the size of a blackbird's. This the foster-parent hatches with great assiduity, and finds no difference in the great ill-looking changeling from her own, or at least treats it as her own. To supply this voracious creature, the credulous nurse toils with unusual labour, and, though forced by perpetual craving to supply extraordinary food for an unusual length of time, yet continues the difficult employment.

Flesh and insects are their nourishment, meal-worm insects especially. The capacity of their stomach is enormous, and reaches from the breast-bone to the vent; it is partly membranous, partly muscular.

They are naturally weak and fearful, as appears by their flying from small birds which every where pursue them, and often drive the female cuckoo from her design of laying in their nest. The young birds are brown, mixed with black; and in that state they have been described by some authors as old ones. A female cuckoo has been found so like a merlin in plumage, as might deceive observers. It moults so entirely as to be naked, and in this state may be mistaken for another animal.

The cuckoo, when fledged and fitted for flight, follows its supposed parent some time; but its appetite for insect food increasing, it quits its supposed dam. The little birds of the grove seem to consider the young cuckoo as an enemy; they pursue it wherever it flies, and oblige it to take shelter in the thickest branches of some neighbouring tree; the wry-neck, in particular, is active in the chase.

Early at the approach of winter, it disappears, and its passage can be traced to no other country. Some suppose it lies hid in hollow trees or rocks, where it is said to have been found naked; others, that it seeks warmer climates; but to what country it retires, or whether it has been ever seen on its journey, is unknown.

Of this bird there are many kinds in various parts of the world, not only differing in their colours but their size, to the amount of above thirty, of various notes, some far from musical, but sufficiently noisy.

The *Hou-hou* of Egypt live principally (if not only) on grasshoppers; never perch on trees, or stand on the ground, but sit on bushes.

The *Cuckoo* of the Cape of Good-Hope, called *Indicator*, has the custom of finding the nests of wild bees; and giving notice, morning and night, to those who seek the honey, he even redoubles his clamour, flies before them, and leads them on if they linger. After they have taken the hive, they always leave him a portion. The sweets are enclosed in a hive, whose opening is too narrow for him by himself to procure them.

The *Tac-bo* of the West Indies devours not only insects, but reptiles, lizards, snakes, frogs, rats; swallow snakes head foremost, and is a bird valuable for its destruction of hurtful animals; is naturally half domestic. Its nest has never been seen. Most of the American cuckoos build and hatch their own young.

One is entitled the *Laugher*, from the resemblance of his note.

The Cockatoo.

OF THE PARROT AND ITS AFFINITIES.

THE ease with which this bird is taught to speak, and the number of words it is capable of repeating, is surprising.

Willoughby tells a story "of a parrot belonging to king Henry the Seventh, who then resided at Westminster, in his palace by the river Thames, which had learned many words from the passengers as they happened to take water. One day, sporting on its perch, the poor bird fell into the water, at the same time crying out, as loud as he could, *A boat, a boat, twenty pound for a boat!* A waterman who happened to be near, hearing the cry, made to the place where the parrot was floating, and taking him up, restored him to the king. As the bird was a favourite, the man insisted that he ought to have a reward rather equal to his services than his trouble; and as the parrot had cried twenty pounds, he said the king was bound in honour to grant it. The king at last agreed to leave it to the parrot's own determination, which the bird hearing, cried, *Give the knave a groat.*"

In their native countries the forests swarm with them. It is asserted by sensible travellers, that the natives of Brasil can change the colour of a parrot's plumage by art; if this be true, they can multiply species at pleasure, to the evident embarrassment of nomenclators.

Their varieties exceed an hundred: to repeat their distinctions, therefore, would be barrenness itself, since their general nature is similar, and after knowledge of one or two, little novelty arises from the rest.

Those of the old continent may justly be separated from those of the new, and divided into the cockatoo, the parrot, the lories, long-tailed paroquet, and short-tailed paroquet: those of the new world divide into the mackaws, the amazons, the criks, the popinjays, the long-tailed paroquet, and short-tailed paroquet.

THE COCKATOO

IS the greatest parrot of the old world, and seems attached to the warmer climates of Asia, India, and the islands of the Indian Ocean; their name expresses their cry generally. Their white plumage, and

THE PIE KIND.

rounded and hooked bill, distinguish them; but especially a tuft on the head, which they can elevate or depress at pleasure. They are not easily taught to speak, some not at all; but they are easily tamed, and often nestle on houses. They seem the most intelligent of their kind; listen, understand, and obey, better than most, and may be taught various tricks and motions; are graceful and agile. That with a white crest is about the size of a hen; is white throughout, except a little yellow under the wings and on the tail; his bill and feet black; his crest is composed of ten or twelve large feathers, of the nature of the wing-feathers, well bearded, placed in two lines, from back to front, and forming a double fan. In some the crest is yellow; in some red. Some are black.

OF PARROTS

THERE are several species; some grey, as the jadoo, which has much docility; brought from Guinea, and the interior of Africa; imitates, by preference, the voices of children; but acquires also the imitations of other voices; is so fond of talking, that he talks in his sleep: learns also to dance, but very awkwardly; loves wine, as do all parrots, and are very merry with it. There are also black of this kind.

THE LORIES

ARE so named from a resemblance to their cry; are distinguished by their plumage, which is red, more or less deep; their bill is less crooked, shorter, and sharper, than in most parrots. They are lively, agile, and the only one which can leap on their stick if placed a foot high; are easily tamed, and preserve their gaiety in captivity. Are found in the Molucca islands, and in New Guinea.

LONG-TAILED PAROQUETS

ARE of various colours; green with a red collar; with wings blue, yellow, and orange; some with blue heads; some green and red; and many various mixtures.

SHORT-

SHORT-TAILED PAROQUETS

ARE very numerous in Asia and Africa; generally build their nests at the end of branches; many of these are but small.

MACKAWS

ARE of splendid plumage; purple, gold, and azure embellish them: they are haughty, yet may be domesticated; are peaceful, gentle, and obedient; all belong to America; are found even in desert islands. They are large birds, equal to a raven; are of four kinds, the red, the blue, the green, and the black. They have long tails, a naked skin of a dirty white, which surrounds the head on each side, and beneath; also the base of the inferior mandible of the bill; this is their distinguishing mark. In the middle of this skin are the eyes, which imparts a disagreeable appearance to these birds. They live in woods, in moist lands, among palm-trees, on whose fruit they feed, and of which are vast forests in overflowed savannas; go in pairs, rarely in flights; sometimes assemble in the morning, and are heard afar off; always cry while flying; fly the best of the kind; cross open places, but never stay; perch on the tops of trees; if they seek food at a distance (as a league) return home at night. Nestle in old trees, enlarging some hole in a rotten part; breed twice a year, laying two eggs, the size of a pigeon's, spotted like those of a partridge. Male and female sit alternately, and jointly provide for their young, nor abandon them till well grown; they are not the best speakers among parrots; their flesh is not bad eating; are very subject to the epilepsy; their disorder is called the cramp, and is said to follow their standing on iron of any kind; their cages, therefore, should be wholly made of wood.

THE AMAZONS

ARE named after their native country; they are distinguished by red on the end of their wings. Their green plumage is brilliant, and even dazzling; the same is the yellow on their heads; they are less than the mackaws; are rare, and come only from Amazonia. They fly

fly in troops; inhabit both woods and mountains; some have red heads, some white, some are yellow.

THE CRIKS

HAVE a little red on their wings, but never on the end; their green plumage is *flat* and yellowish; the yellow on their heads is dull, and mixed with other colours; they are much smaller than mackaws, and are the commonest of all parrots; they are much like the amazons in manners, and both, in many respects, conform to the mackaws. Cotton seed makes these (and all) parrots drunk; as also do fumes of tobacco, which the Indians blow into their bills, in which state they are less wild, and more manageable. Some criks are yellow-necked, some powdered, some have blue faces, some blue heads, and some violet heads.

THE POPPINJAYS

ARE less than the amazons, and have no red in their wings; are of various colours, yellow, red, and mottled.

The long and the short-tailed **PAROQUETS** of the new world, are extremely various, beautiful, docile, and entertaining.

PARROTS are formed alike, their toes two before and two behind for climbing and holding; strong hooked bills for breaking nuts and hard substances, on which they feed; and loud harsh voices, by which they fill their native woods with clamour. Their toes are remarkable, which appears when they walk or climb, and when eating. To climb, they stretch two of their toes forward and two backward; but when they feed, they bring the food to their mouths with their foot, and dexterously turn the greater hind toe forward, so as firmly to grasp the nut or fruit, standing all the while on the other leg. Other animals turn their meat inwards to the mouth; whereas these turn their meat outwards, and thus hold the hardest nuts, as if in one hand, till with their bills they break the shell, and extract the kernel. The bill has great peculiarities, for both chaps are moveable. In most other birds, the upper chap unites with the skull; but

but in these (and in one or two species of the feathered tribe more) the upper chap is connected to the bone of the head by a strong membrane, placed on each side, that lifts and depresses it at pleasure. By this contrivance, they can open their bills the wider, to great advantage, as the upper chap is so hooked and over-hanging, that, if the lower only had motion, they could scarce gape sufficiently to take their nourishment.

These birds cannot readily hop from bough to bough (their legs not being adapted), but use both the beak and feet; first catching hold with the beak, then drawing up the legs and fastening them, then projecting the beak again, and then the feet, till they have completed their progress.

The tongue somewhat resembles that of man; but the organs by which sounds are articulated lie farther down in the throat, to which contributes the great motion which the os hyoides has in these birds.

The parrot, though common in Europe, rarely breeds here; and though it bears our winter when arrived at maturity, yet loses both its spirit and appetite during the colder part of the season, and seems quite changed from that bustling loquacious animal which it appeared in its native forests.

A parrot at first obstinately resists instruction; but is won by perseverance; attempts to imitate the first sounds, and when it has got one word distinctly, the succeeding come with greater facility.

The parrot, called Aicurus (an Amazon), the head of which is yellow, red, and violet, the body green, the end of the wings red, the tail long and yellow, is asserted by Clusius to be a prodigy of understanding. "A Brazilian woman had a parrot of this kind, which was the wonder of the place. As we passed by her house, she used to call us to stop, promising, if we gave her a comb, or a looking-glass, she would make her parrot sing and dance to entertain us. If we agreed, as soon as she had pronounced some words to the bird, it began not only to leap and skip on the perch on which it stood, but also to talk and to whistle, and imitate the shoutings and exclamations of the Brazilians when they prepare for battle; if the woman bid it to sing, it sang; if to dance, it danced. But if, contrary to our promise, we refused payment, the parrot seemed to sympathize in her resentment, was silent and immovable; neither could we, by any means, provoke it to move either foot or tongue."

As those birds have the greatest docility that are taken young, a nest is considered as worth taking some trouble to be possessed of; the usual method is, by cutting down the tree. The old are shot in the woods

with heavy arrows, headed with cotton, which knocks down the bird without killing it : some die, but others recover, and, by kind usage and plentiful food, become talkative and noisy.

Some of them are, particularly the small paroquet tribe, delicate food. In general, whatever fruit or grain they mostly feed on, their flesh partakes of the flavour. When the guava is ripe, they are fat and tender ; if they feed on the seed of the acajou, their flesh contracts an agreeable flavour of garlick ; if they feed on the seed of the spicy trees, it tastes of cloves and cinnamon.

The paroquet kind in Brasil, Labat assures us, are beautiful and talkative, very tame, and appear fond of mankind ; pleased with holding parley with a man ; they never have done ; but while he continues to talk, answer him, as if resolved to have the last word.

When a fowler in pursuit of them walks into the woods, as they are green, and exactly the colour of the leaves among which they sit, he only hears them, without seeing a single bird ; sensible that his game is within gun-shot in abundance, he is mortified to the last degree that it is invisible. Unfortunately for themselves, they are ever on the wing ; for as soon as they have stripped the tree on which they sat of its berries, some one of them flies to another ; if fit for their purpose, it gives a loud call, to which the rest resort. At this opportunity the fowler fires among the flock while on the wing, and seldom fails of bringing down some.

On the coast of Guinea, parrots are considered by the Negroes as their greatest tormentors. The parrots persecute them with unceasing screaming ; and devour whatever fruits they attempt to produce in their little gardens.

The green paroquet, with a red neck, was the first brought into Europe, and the only one known to the ancients from the time of Alexander the Great to the age of Nero. This was brought from India ; afterwards the Romans found others in Gaganda, an island of Ethiopia.

THE

PIGEON AND ITS VARIETIES.

THE tame pigeon, and its varieties, derive their origin from the stock-dove, the English name, implying its being the *stock* of the other

other domestic kinds. This bird, in its natural state, is of a deep blueish ash colour; the breast enlivened with fine changeable green and purple; its wings marked with two black bars; the back white, the tail near the end barred with black. These simple tints have deviated into unlimited variety.

The Stock-dove, in its native woods, breeds in the holes of rocks and the hollows of trees. All other of the pigeon-kind build in the topmost branches of the forest. But this soon takes to build in artificial cavities; and, excited by ready provision and numerous society, easily becomes domestic. It preserves its native colour for several generations.

The dove-house PIGEON breeds every month; but must be supplied with food when the weather is severe, or the fields are covered with snow. Lays two white eggs, which usually produce young of different sexes. The female sits fifteen days, in cold weather more, relieved at intervals by the male. The intervals are usually regulated with great exactness. From three or four o'clock in the evening till nine the next day, the female sits; then the male takes his place from ten till three, while his mate is feeding abroad. If the female delays her return, the male follows, and drives her to the nest; should he in his turn be dilatory, she retaliates upon him.

The young require no food the three first days, only warmth, which the female supplies entirely, nor ever stirs out, except for a minute's food. The old ones gather corn or grain in the fields, and keep it in their crops, from whence they throw it up into the mouths of their young, who greedily demand it.

Of all birds, for its size, the pigeon has the largest crop, which has also peculiar properties. Air, blown into the wind-pipe, distends the crop or gullet prodigiously. By what apertures the air thus blown enters the crop is unknown; but some of them (which are called croppers) can so much distend it, that the bird's breast seems bigger than its body. The use of the air, thus introduced, is to contribute to the ejection of the half-macerated grain contained in the crop, with which the pigeon feeds its young. The expansive and contractive powers of the crop enable it to hold a greater quantity than otherwise it would, and to eject it at pleasure. This the young receive open-mouthed; being thus fed three times a day. In feeding, the male usually supplies the young female; and the old female supplies the young male. When well fed, the old ones do not wait the total dismissal of their young; but in the same nest are found young ones almost fit for flight, and eggs hatching.

The fidelity of the turtle-dove is proverbial ; but the pigeon of the dove-house is not faithful. Two males often quarrel for the same mistress ; if the female admit the addresses of a new gallant, her old companion is displeased, abstains from her company, or approaches only to chastise her. There have been instances when two males, displeased with their respective mates, have exchanged them, and have lived in great harmony with their new companions.

So prolific is this bird, that near fifteen thousand may in the space of four years be produced from a single pair. But the stock-dove seldom breeds above twice a year ; ceasing in winter. They seem to have a stronger attachment to their young than those who breed so often. From a species of these, those pigeons called carriers, are produced. These are easily distinguished by a broad circle of naked white skin round their eyes, and by being of a dark blue or blackish colour. From their attachment to their young, these birds are employed as carriers. They are first brought from home, the letter is tied under the bird's wing, and it is let loose. It ascends directly into the clouds to an amazing height ; then, directing itself by some surprising instinct towards home, sometimes at many miles distance, brings its message ; in the space of an hour and a half performing a journey of forty miles.

The varieties of the pigeon are beyond mention. Hence we have croppers, carriers, jacobines, powters, runts, turbits, and a thousand other varieties, heightened by food, climate, and pairing, producing different species.

The RING-DOVE is larger than the former ; builds its nest with a few dry sticks, in the boughs of trees, and maintains its native freedom, notwithstanding attempts to render it domestic : for, though their eggs have been hatched by the tame pigeon in a dove-house, yet, as soon as they could fly, they always betook themselves to the woods. In winter assemble in great flocks in the woods, and leave off cooing till March ; neither do they coo in wet weather ; is, in some places, a bird of season.

The TURTLE-DOVE is smaller, and shyer, than the former ; is distinguished by the iris, of a fine yellow, and by a beautiful crimson circle that encompasses the eye-lids. The fidelity of these birds is noted ; and a pair being caged, if one dies, the other will not survive it. Is a bird of passage ; few or none remain in winter ; they come late, and depart early. They fly in flocks when they come to breed here in summer, and delight in open, mountainous, sandy countries. But they build in woods, and choose the most retired situations. Feed on grain ; are fond of millet.

The

The *Peacock-pigeon* that (female as well as male) spreads the tail is a curious variety, has thirty feathers in the tail (others have but twelve); they advance their tail when they spread it, and throw back the head till it almost touches the tail, trembling all the time, and agitating the head and neck. The wind often acts so powerfully on this large tail as to dash them to the ground.

To this list might be added a long catalogue of foreign pigeons, of which we know little more than the plumage and the names. The *CROWN-FOWL*, which belongs to the family of pigeons, is in size equal to a turkey; native of the isle of Banda: in India they breed them as poultry. In America a species the size of a lark.

BIRDS OF THE SPARROW KIND.

THESE chiefly live in the neighbourhood of man, and among them are those endowed with musical notes. Their living near man is not the result of affection but of necessity, and because inhabited grounds furnish their chief provision; the desert yields neither grain nor tender buds, nor insects; the recesses of the forest abound in enemies, not in advantages. All birds, even those of passage, seem content with a certain district to provide food and shelter in. The red-breast or the wren seldom leaves the field to which it is accustomed; they mark out a territory to themselves, on which they will permit none of their own species to encroach; but guard their dominions with the utmost vigilance. When food is in plenty they never wander. Some are called birds of passage, because obliged to take long journeys for this necessary; but, strictly speaking, most other kinds are birds of passage, though their migration is less extensive, either from one county to another, or from the more inland provinces toward the shore. Respecting these, autumn is the principal season when the bird-catcher employs his art to entrap the wanderers, which is chiefly effected by the aid of his call-birds; these having moulted prematurely in a warm cage, call louder and better than those that are wild: there even appears a malicious joy in these call-birds, to bring the wild ones into captivity. Their sight or hearing is exquisite; the instant the wild birds are perceived, notice is given by one of the call-birds, who all unite in the same tumultuous ecstacy of pleasure, inciting the wild ones by short jerks. The allurement of this call is so great, that the wild bird on hearing it is stopped in
its

its most rapid flight. It frequently happens that if half a flock only are caught, the remaining half will immediately afterwards alight between the nets, and share the fate of their companions; or should only one bird escape, this unhappy survivor will also venture into danger till it is caught; such a fascinating power have the call-birds.

It is not easy to account for the nature of this call, whether it be a challenge to combat, an invitation to food, or to courtship; whether their motives be gallantry or war, the small birds are equally remarkable for both.

For however contemptible these little warriors are to larger creatures, they are often formidable to each other; and sometimes fight till one of them yields up his life with the victory. Sometimes two male birds shall strive in song till, after a long struggle, the loudest shall entirely silence the other. During these contentions, the female sits a silent auditor, and often rewards the loudest songster with her company during the season. Singing among birds is almost universally the prerogative of the male; it serves as a blandishment at first; as delight to her during the time of incubation; as security, to assure her that no danger threatens; for if danger offers, the male stops suddenly, as a signal to his mate to provide for her security.

Willoughby has divided the smaller birds into (1.) those that have slender bills, and (2.) those that have short and thick bills. Those with slender bills chiefly live on insects; those with short, strong bills, live mostly on fruits and grain. Among slender-billed birds, he enumerates the thrush, the blackbird, the fieldfare, the starling, the lark, the titmouse, the water-wagtail, the nightingale, the red-start, the robin red-breast, the beccafigo, the stonechatter, the whinchat, the goldfinch, the whitethroat, the hedge-sparrow, the pettichaps, the golden-crowned wren, the wren, the humming-bird, and several others of the sparrow kind unknown in this part of the world.

These seek and destroy the eggs of insects that would otherwise propagate in numbers beyond the arts of man to extirpate: they know better than man where to seek for them; and thus at once satisfy their own appetites, and render him the most essential services. In this tribe, we have the sweetest songsters of the grove, the nightingale, the thrush, the blackbird, the lark, the red-breast, the black-cap, and the wren.

Birds of the sparrow kind, with thick and short bills, are the grosbeak, the crossbill, the greenfinch, the bullfinch, the house-sparrow, the chaffinch, the brambling, the goldfinch, the linnet, theiskin, the bunting, the

the yellow-hammer, the ortolan, the wheat-ear, and several other foreign birds, of which we know rather the names than the history. These chiefly feed on fruits, grain, and corn: the harvest often suffers from their depredations; but they also have their uses, and are frequently the distributors of seeds into different districts; and some are thought to thrive the better, for having undergone a kind of maceration in the stomach of these birds before they are voided. The songsters of this class are the canary-bird, the linnæa, the chaffinch, the goldfinch, the greenfinch, the bullfinch, the brambling, the siskin, and the yellow-hammer. Their notes are not so generally pleasing as that of the former class, but they usually hold it longer; and, in a cage, these birds are more easily fed, and are more hardy.

OF THE

THRUSH AND ITS AFFINITIES.

WITH the thrush we may rank the red-wing, the fieldfare, the blackbird, the ring-ouzel, and the water-ouzel.

To this tribe may be also added the stare or starling, which, though with a flat bill, too much resembles these birds to be placed any where else.

The MISSEL-THRUSH is distinguished by its superior size; it differs little from the throftle; but the spots on its breast are larger. It builds in bushes, or on the side of some tree, ten or twelve feet high (as all this kind do); lays four or five eggs, deep blue, black spots; its song is very fine, which it begins in spring, sitting on the summit of a high tree; sings more than half the year; the largest of all birds that have musical voices; all greater birds either screaming, chattering, or croaking: feeds on insects, holly, and milletoe-berries; when frightened or disturbed sends forth a very disagreeable scream; is in Burgundy a bird of passage; pair early; breed twice a year; sexes closely resemble; both assist in bringing up their young; live in woods; sometimes get drunk by eating ripe grapes, and are taken by thousands.

There is a white thrush, which yet retains the breast spots; also a tufted thrush.

The BLACKBIRD whistles early in spring, and all summer-time, with a note extremely pleasing at a distance (being the deepest toned warbling of the woods), but rather unpleasant in a cage, being too loud; lays four or five blueish eggs, in a nest usually built at the stump of some old hawthorn, well plastered on the inside with clay, straw, and hair. Is more easily tamed than thrushes; readily improves its song, and will counterfeit the human voice; love to bathe themselves. Birds of prey are fond of their flesh. Of the same kind are some black and white, some white, and some rose-coloured: to avoid, therefore, the ridicule of a rose-coloured black-bird, the class should assume its old English name of ouzel.

Among the ouzels must be reckoned the BLUE-BIRD, which resembles a blackbird, except in colour; it lives in the highest Alps (as also a rock-ouzel, which even there chooses the most craggy rocks and the most frightful precipices for its residence); is rarely caught, but highly esteemed in the countries where it breeds. It not only whistles delightfully, but speaks distinctly; is docile, and, though waked at midnight by any of the family with a light, it will speak and whistle. Its colour, toward winter, from blue becomes blackish, which re-changes to its original hue early in spring. It makes its nest in deep holes, or in solitudes inaccessible, not only by man, but also by the shammoy, or other wild animals: produces usually five young; seldom descends into the plain; flies swifter than a blackbird, and uses the same food; defends its nest by striking at the eyes of the assailants.

The FIELDFARE and the RED-WING make but a short stay in this country. With us they are insipid tuneless birds, flying in flocks, and excessively watchful to preserve the general safety. Their season of music and pleasure is employed in the more northern climates, where they sing most delightfully, perched among the forests of maples, with which those countries abound. They build their nests in hedges, and lay six blueish-green eggs spotted with black. Linnæus mentions a fieldfare so tame as to drink wine out of the glasses on the table; he drank so much as to render him bald; but being kept a whole year without wine, his feathers returned. Is a bird of passage, closely allied to the thrush.

The STARE, or STARLING, distinguishable from the rest of this tribe by the glossy green of its feathers, in some lights, and the purple in others, and its spots, breeds in hollow trees, eaves of houses, towers, ruins,

ruins, cliffs, and often in high rocks over the sea; its young resemble those of the thrush very closely; lays four or five eggs, pale greenish ash-colour; makes its nest of straw, small fibres of roots, and such like; and often uses the nests of other birds. Its voice is rougher than the rest of this kind; but what it wants in the melody of its note, which it will learn, it compensates by the facility with which it is taught to speak. It speaks equally French, German, English, Latin, Greek, not words only, but phrases, and pronounces distinctly that difficult letter R. So soon as their young are able, these birds assemble in vast flocks, and feed upon worms and insects; at the approach of spring, they assemble in fields; often fly in a troop so united, yet so agitated, and rolling on itself, that they embarrass a bird of prey, which, unable to determine on any one for prey, quits the whole. They assemble especially in evenings; pass the night among reeds; chatter much while together; are fond of cherries; live on grain, fruit, and insects; drink, much like the cock, and take delight in bathing. In foreign parts some are white, some black and white, and some grey.

To this tribe might be added above an hundred other birds of nearly the thrush size, and living like them upon fruit and berries: but as it is impossible to describe the splendid tints that adorn the foreign birds of the thrush kind, passing these beautiful, but little known kinds, we advert to the American mock-bird, the favourite songster of a region where the birds excel rather in the beauty of their plumage than the sweetness of their notes.

The American Mock-BIRD is but a plain bird to the eye, about the size of a thrush, a grey-brown colour, has a few slight breast spots, and a reddish (in some blackish) bill; blackish feet. It is possessed not only of its own natural notes, which are musical and solemn, but it can assume the tone of every other animal in the wood, from the wolf to the raven. It seems even to sport itself in leading them astray; will first allure the lesser birds with the call of their mates, then terrify them with the screams of the eagle. There is no bird in the forest but it can mimic; and there is none that it has not at times deceived.

The Indians have named it *cencontlatolli*, which means four hundred languages. Not only he sings well, but with energy, and accompanies his voice with regular motions; he first rises on his wings, then falls head foremost several times; then he begins dancing, and accompanies it with his song. If his song is lively, his flight describes in the air a multitude of crossing circles, mounting, descending, and frisking;

if his song is vigorous, he beats his wings in cadence; if his song becomes solemn, *piano*, and seemingly lost in silence, he sinks gradually down, gently hovers over his tree with imperceptible undulation of his wings, and settles as if motionless while suspended in the air.

The *French Mock-bird* has breast-spots in common with the thrush, and is about the same size; inhabits Carolina and Virginia.

THE MARTIN

IS allied to the ouzel kind in form; inhabits the Philippine Islands; is extremely voracious; like our pies and crows seeks among the hair of horses, cows, &c. the insects which torment them; ten or a dozen will sometimes alight on the same animal; but should it have any part of its flesh bare by a fore, the martins make free with that also, and become a much worse plague than the vermin of which they rid the animal: will devour small rats, and swallow them; are particularly fond of grasshoppers; settle in such flocks on a tree as to cover it, so that scarce a leaf can be seen; brought up young among poultry, imitate their cries and motions; are of mixt colours, grey, black, and white.

OF THE

NIGHTINGALE, AND OTHER SOFT-BILLED SONG-BIRDS.

THIS most famous of the feathered tribe visits England only in April, and leaves us in August; is unknown in Scotland, Ireland, and North Wales. They frequent thick hedges and low coppices, and generally keep in the middle of the bush, so that they are rarely seen. They begin their song in the evening, and generally continue it the whole night; for weeks together, if undisturbed, sit upon the same tree. His note is soft, various, and interrupted; he seldom holds it without a pause above the time that one can count twenty: this bird's music is more pleasing because heard when all the rest are silent.

Gesner

Gesner assures us that it is not only the most agreeable songster in a cage, but that it is possessed of a most admirable faculty of talking.

In the beginning of May, the nightingale prepares to make its nest, which is formed of the leaves of trees, straw, and moss; it is built at the bottom of hedges where the bushes are thickest and best covered, yet is often destroyed by foxes, weasels, snakes, &c. While the female continues sitting (about eighteen days), the male, at a distance, but within hearing, cheers the patient hour with his song. She lays four or five eggs, uniform greenish brown, of which but a part, in our cold climate, comes to maturity. The female feeds her young from her crop.

It sleeps in the day-time, while it sings during night, and not only sleeps but dreams, having been heard to warble, &c. in a very low and indistinct manner: They bathe after singing, and in an evening. A male, which escaped from his cage, rushed into a fire that was near; probably being dazzled by it. Lives many years; becomes grey by age. Pliny mentions a white nightingale presented to Agrippina, wife of Claudius, which cost sixty thousand sesterces; little short of two thousand pounds. Is found in Persia, China, and Japan.

The RED-BREAST, during the spring, haunts the wood, the grove, and the garden; retires to the thickest and shadiest hedge-rows to breed; but in winter seems to become more domestic, and often claims protection from man: the first awake in the woods in a morning, the last at going to repose at night. The red-breast continues with us the year round, and endeavours to support the famine of winter by chirping round the warm habitations of mankind, by coming into shelters which moderate the rigour of the season, and where insects are found (if at all) attracted by the same cause.

This bird breeds differently in different places: in some countries, its nest is usually found in the crevice of some mossy bank, or at the foot of an hawthorn in hedge-rows; in others, it chooses the thickest coverts, and hides its nest with oak leaves. The eggs are from four to five, of a dull white, with reddish streaks; is in some countries a bird of passage.

There is a BLUE-BREAST, which, except in that colour, little differs from the red-breast; lives in moist places; equally familiar; sings at night. Also a blue-red-breast in America.

LARKS, whether the sky-lark, the wood-lark, or the tit-lark, are distinguishable by the length of their heel. Their song is loud and pleasing.

The

The SKY-LARK builds its nest upon the ground, beneath some turf that serves to hide and shelter it. The female lays four or five eggs of a dusky greyish colour, spotted brown; sits about fifteen days; her young are soon moving from the nest: while she is sitting the male usually entertains her with his singing, chiefly morning and evening; while he rises to an imperceptible height, still has his lovely partner in his eye, nor once loses sight of the nest while he is ascending or descending: never perches on trees; are often carried by strong winds many miles out to sea; often taken by being attracted by larking-glasses, a kind of mirror, whose brilliancy excites their attention. The cuckoo often lays in their nests. There is a white lark, and also a black one. Of the tit-lark we remark that it can perch upon trees, and that the female sings.

The BLACK-CAP and the WREN, though so very diminutive, are yet prized by some for their singing: the former is called by some the mock-nightingale; his song lasts longer, and he is easily and thoroughly tamed: the latter is admired for the loudness of his note, compared to the little body from whence it issues. The wren inhabits walls, stacks of wood, barns, &c. enlivening winter with his notes; his tail always erect; he hardly weighs a quarter of an ounce; lays eight or ten eggs, in a round nest, which looks like only a ball of moss, and thereby escapes notice.

The GOLDEN-CRESTED WREN is among the smallest of birds; he escapes easily through the meshes of a net, or the wires of a cage. Nature has given him a tuft, and crown; and as most languages have called him little *king*, KING let him be: he is so small that if he now appears he is instantly invisible; the smallest leaf conceals him; the smallest insects (or their larva) are his food, and small worms, which he devours till he is full; active and lively, weighs one hundred and twenty grains.

OF THE

CANARY-BIRD AND FINCHES.

THOUGH, by its name, it appears that this bird came originally from the Canary Islands, yet we now have them from Germany, where they are bred in great numbers, and sold into different parts of Europe.

Europe. About a century ago they were sold at very high prices, and kept only by the great; they have since multiplied abundantly. In Italy and Provence are species of finches, nearly allied, and capable of breeding together.

In its native islands, the canary-bird is of a dusky grey colour, and so different from those usually seen in Europe, that some have even doubted whether it be of the same species: by their domesticity they are become some white, some mottled, some greenish; but are more esteemed for their note than their beauty; it is shrill and piercing, like all of the finch tribe, continuing long in one breath without intermission, then rising higher and higher by degrees, with great variety. The nightingale is the songster of the woods, the canary-bird the musician of the chamber; of retentive memory and apt imitation, he exchanges his native notes for the compositions of art.

More easily reared than any of the soft-billed birds (but subject to the epilepsy); his song continues throughout the year. In choosing the canary-bird, those are best that appear with life and boldness, standing upright on the perch, and not apt to be frightened.

Canary-birds sometimes breed throughout the year, but usually pair in April, and breed in June and August; they are generally two or three days in building their nests; the hen commonly lays five eggs, and sits fourteen days; sometimes the female is ready to hatch a second brood before the first quits the nest; then the male breeds up the young left behind, and sits them for a state of independence. The female canary-bird pairs with the linnet, or gold-finch, and produces a mixed breed, like the canary-bird, and resembling it in song. The species has increased in the West Indies, and exists in Abyssinia.

THE BULL-FINCH

IS remarkable for his aptness in acquiring, and memory in retaining, the lessons taught him; though his native notes are harsh, yet he is capable of the most melodious, and this capacity is not restricted to the male, but belongs to both sexes: not only he learns the airs which are taught him, but he often embellishes them by taste or expression, and seems to sing as if prompted by sentiment. Is capable of attachment. One that had escaped from its cage, after a year's liberty, returned to its

owner, and recollected her voice. Others have died when separated from their masters. In short, they have an excellent memory. One which had been thrown down in its cage by some *blackguards*, though not seemingly injured at the time, ever after fell into convulsions at the approach of ill-looking people, and in one of these fits died, eight months after its fall. The young begin to whistle when able to eat alone : of four young ones, the three eldest, which were able to eat, fed the fourth that was unable. They are constant to their consorts, the year round ; have the look of attention and thought, yet are easily entrapped ; their skin is very fine ; their flesh bitter or eatable, according to the fruit or grain on which they have fed ; some of them are of passage ; come in April, return in October.

The gold-finch learns a fine song from the nightingale ; the linnet as well as bull-finch may be taught, forgetting the wild notes of nature, to whistle a long and regular tune ; but his own natural song is pretty. He is a long-lived and healthy bird. The chaffinch offers less of song, and many of the finches have none at all ; indeed some have neither good melody nor good manners ; witness the following.

THE GROSS-BEAK

IS so named from the size, thickness, and strength of his bill : it were desirable that his character could be vindicated from the charge of ill-nature ; or else, it is well that his numbers are but few : silent, solitary, but courageous, and boldly defending their nests ; their strength of bill enables them to crack nuts and other hard substances, but also to destroy birds smaller than themselves ; for without a quarrel, or a word speaking, they attack them by biting pieces out of them, not by striking with their bill. Nearly allied in figure and manners is

THE CROSS-BILL,

WHICH alone is distinguished by this conformity (some say deformity) of bill : the bill is crossed sometimes to the right, sometimes to the left : whether this arises from the habit of the bird to take its food on the right or left side, is uncertain ; the mandibles of the bill

The Cross-bill

bill overgrowing, the points will not meet, so that he cannot strike forward to any advantage. He feeds on the grains found in pine-apples, and is extremely dexterous in procuring them, by detaching the scales of the pine-apple, under which they lie. His cross-bill also serves him in climbing, like a parrot's, and hence some have called him the German parroquet : they are but dull birds.

OF THE SWALLOW AND ITS AFFINITIES.

THE GOAT-SUCKER.

THERE is nothing more unfortunate in natural history, than when a creature has obtained a name, which expresses false manners as if appropriate to it ; this is instanced in the present article, which, if properly named, should be entitled

THE NIGHT-SWALLOW,

As coming nearest to its true character ; yet it differs from the swallow by being a bird of night, by being solitary, by its voice, by the number of its eggs, by its laying them bare on the ground, and by its time of appearing and disappearing. It agrees in exterior form, and much of its manners, its short feet, small bill and large throat, its food, and method of taking it. Lives upon insects, especially those that fly by night ; he chases in the evening twilight, for light dazzles him ; he has no need to shut his mouth to secure his prey, for the inside of his bill is replete with a kind of glue, adhesive enough to retain as well moths as beetles, and to hold them by their wings. They are spread in various parts of the world ; many in America : any hole serves for a nest ; lays two or three brownish eggs ; is very jealous of her nest's being discovered. Their open mouth causes a sound, which in some parts of England procures them the name of wheel-bird, for their humming noise resembles that of a spinning-wheel.

The Night-Swallow then is the largest of this kind; but its tail not forked. To this tribe belong the House-Swallow, which is too well known to need a description; the Martin, inferior in size to the former, and the tail much less forked; its nest is covered at top, whereas that of the house-swallow is open; and the Swift, rather larger than the house-swallow, with all the toes standing forward, in which it differs from the rest of its kind: it comes later and goes sooner; lays in old walls, as high as it can; makes no nest, but lines the hole with litter: these resemble each other so strongly, that it is not without difficulty the smaller kinds are known asunder; they are considered as friendly to man by their destruction of insects; in some places perch in multitudes on trees during night, choosing the branches sheltered from the wind, which afterwards die.

They have all very large mouths, when flying always kept open; short slender feet, scarce able to support the weight of their bodies; and wings of immoderate length for their bulk: their plumage is glossed with a rich purple; their note is a slight twittering, which they seldom exert but upon the wing.

Their food is insects, which they always pursue flying; during fine weather, when the insects are abroad, the swallows are ever on the wing, pursuing their prey with amazing swiftness and agility, through their shortest turnings, its long tail like a rudder turning its most rapid motions.

Early in the spring, when the re-warming sun begins to rouse the insect tribes, the swallow is seen returning from its distant migration, and making its way feebly from other shores: as the weather grows warmer, and its insect supply increases, it gathers greater strength and activity; but sometimes a rainy season, by repelling the insects, stints the swallow in its food; when the weather is fair, the insect tribes make bolder flights; the swallow follows their aerial journeys, often so high as to be imperceptible. When the weather is likely to be foul, the insects fly low; and from the swallow's following, we are often foretold the approaching change; often they dip in the water, in pursuit of their prey, or aquatic insects; and in times of scarcity they dispute with the spiders, and even swallow them also.

The swallow's nest is built with great industry and art; particularly by the common swallow, which builds on the tops of chimneys; the martin sticks it to the eaves of houses; the night-swallow on the bare ground, as do the bank-martins; this nest is built with mud from some neighbouring

ing brook, or such as has been cast up by worms, well tempered with the bill, moistened with water for better adhesion, and farther kept firm by long grafs and fibres ; within it is lined with goose feathers.

On the coasts of China and Coromandel, says Willoughby, are “ a sort of party-coloured birds, of the shape of swallows ; these at their breeding-time come (some out of the country) to the rocks, and from the foam or froth of the sea-water dashing against the rocks, gather a certain glutinous matter (the spawn of fishes), of which they build their nests ; these the Chinese pluck from their stations, and bring in great numbers to sell ; they are esteemed great delicacies when dissolved in chicken or mutton broth, far before oysters, mushrooms, or other dainty or liquorish morsels.” This kind of sperm of fishes often floats on the sea for leagues together, in those climates.

Usually lays from five to six eggs, white, speckled with red ; sometimes breeds twice a year. The swallow supplies her broods very plentifully, the first particularly ; always keeps her nest clean.

At the latter end of September, or in October, they leave us ; a few days previous to their departure, vast flocks assemble on house tops, as if deliberating on their fatiguing journey, which is thought to be usually to Senegal, and along the Morocco shore : they set out at night, to avoid birds of prey ; always choose a favourable wind ; the latter weakly broods, which are not yet in a condition to set out, delay, and are sometimes too feeble to venture ; these wretched little families, being compelled to stay, perish in cold weather ; while the tender parents share the fate of their offspring, and die with their new-fledged brood. They are thought to perform their fatiguing journey in about seven days ; when interrupted by contrary winds, in their course far off at sea, they alight on whatever ship they find in their passage, spent with famine and fatigue, yet still they boldly venture, when refreshed by a few hours rest, to renew their flight, and continue their course. They do not breed in Senegal, nor ever bring with them into Europe young of the same year.

Yet it remains doubtful whether all swallows migrate, or whether there may not be some species, that, though externally alike, is so internally distinct as to be very differently affected by the approach of winter. Many witnesses affirm, that swallows hide in holes under ground, or in rocks or crevices, or in caverns in mountains ; some inform us that they have seen them taken out of the water, and even from under the ice, in bunches. Reaumur, who particularly interested himself in this inquiry, received several such accounts.

That some may hide in warm caverns is possible, but that they do not hide under water has been pretty well proved, by the noted experiment of Frisch, who tied several threads dyed in water-colours, round the legs of swallows, that were preparing for departure : these, the ensuing summer, brought their threads back with them, no way damaged in colour ; which most certainly they would have been, if, during winter, they had been steeped in water.

Kolben says, that, at the Cape of Good-Hope, they are seen all the year ; but in greatest numbers in winter. There are many kinds, as well in America as elsewhere ; in general, pretty closely related by form and manners.

THE

HUMMING-BIRD AND ITS VARIETIES.

OF all that flutter in the garden, or enliven the landscape, the humming-bird is the most delightful. Of this charming little species there are varieties, from the size of a small wren, to that of an humble-bee, sporting in the fields of America, from flower to flower, and extracting their sweets with its little bill. They seem confined between the tropics ; follow the sun to the solstices, and retire with him. The Indians called them rays, or hair of the sun.

The smallest humming-bird is about the size of a hazel-nut ; the feathers on its wings and tail are grey-black ; those on its body, and under its wings, golden-greenish brown, with an inimitable red gloss ; a small crest on its head, green at bottom, gilded at top, which sparkles in the sun ; the bill is black, straight, slender, like a fine needle. Found in Brasil and the Windward Islands. The larger humming-bird is near half as big as the common wren, and without a crest ; is covered from the throat, half way down the belly, with crimson-coloured feathers, that, in different lights, exhibit a variety of beautiful colours ; head small, with very little round eyes, as black as jet ; legs and feet very small, often black ; ten feathers in the tail.

There are upwards of twenty kinds of humming-birds, beside the COLIBRIS, which differ only in having the bill a little curved, and bending

Humming

Birds

Colibri

bending throughout; of these are above twenty sorts; some are also rather larger; their manners are precisely the same; and knowing one is knowing both.

As soon as the sun is risen, the humming-birds, of different kinds, are seen fluttering about the flowers, without ever alighting on them. Their wings vibrate so rapidly, that it is impossible to discern their colours, except by their glittering. They seem actionless by force of their activity, continually in motion, visiting flower after flower, and extracting its honey. For this purpose they possess a tongue, composed of two hollow grooves, forming a little canal, divided at the end; this is thrust into the cup of the flower; upon this nectar they subsist. The rapid motion of their wings occasions a humming sound, from whence they are denominated. They chase and drive off birds twenty times their size. Impatience is their general character; they even tear in a pet, a flower whose sweet is exhausted. They are solitary.

Their nests are suspended at the point of a twig of an orange, a pomegranate, or a citron tree (sometimes even in houses, if they find a small and convenient twig for the purpose); the female is the architect, while the male furnishes materials, cotton, fine moss, and vegetable fibres; of these a nest is composed (about the size of an hen's egg cut in two), warmly lined with cotton. They lay two eggs, the size of small peas, white as snow, with here and there a yellow speck: the male and female sit by turns, but the female most; she seldom quits the nest, except a few minutes morning and evening, when the dew is upon the flowers, and their honey in perfection. During this short interval, the male takes her place; for the egg is so small, that exposing it ever so short a time to the weather, might injure it: she sits twelve days, when the young appear, the size of a fly, at first bare; by degrees they are covered with down; and at last with feathers; but less beautiful than those of their parents.

Father Mondidier, in the mission to America, found the nest of a colibri in a shed, and took it in, when the young were about fifteen days old: he placed them in a cage at his chamber window, to be amused by their sportive flutterings; but he was soon surprised to see the old ones, that came and fed their brood regularly every hour in the day. By these means they themselves soon grew so tame that they seldom quit-
ted the chamber; but, without any constraint, came to live with their young ones. All four have frequently come to perch upon their master's
PART IV. No. 26. O hand,

hand, chirruping as if at liberty. He fed them with a very fine clear paste, made of wine, biscuit, and sugar; they thrust their tongues into this paste, till they were satisfied, and then fluttered and chirruped about the room; ever attentive to the voice of their master, when he called them. In this manner they lived with him six months, when he unfortunately forgot to tie up their cage to the ceiling at night, to preserve them from the rats, and he found they were devoured in the morning.

These birds, on the continent of America, at Surinam, and at Jamaica, continue the whole year; as the honey of flowers never fails them in those warm latitudes: but in the Antilles; when the winter approaches, they retire, and, some say, continue torpid.

It is a doubt whether or not these birds sing: Labat asserts, that they have a most pleasing melancholy melody in their voices, though small and proportioned to their organs. Some may possess agreeable voices, though the rest may in general be silent.

The Indians formerly made great use of this pretty bird's plumage, in adorning their belts and head-dresses. The children take them in the fields upon rings smeared with bird-lime: they are instantly killed and gutted, and hung up to dry.

Not very distant in nature are those birds, which live only on the sweets of the sugar-cane; nor very distant in plumage, since the Creoles often confound them.

W A T E R - B I R D S.

WATER-BIRDS enjoy at once the land, the air, and the waters; not indeed that they seek the land, but at a time when necessity impels them; nor that they wing the air, but to attain some situation otherwise impracticable. The water is their abode; here they feed, they rest, and often sleep; and to this they train their offspring in their earliest powers. Tempests and storms are familiar to them; with the rising and the falling billows they rise and fall; sport in the dashing spray, and view, without alarm, the rolling gulph. Many of them traverse the vast ocean, and are found hundreds of leagues from shore; others inhabit rocks, and are attached to the surrounding seas. Some prefer temperate climates; others (and those the greater number) choose frozen dwellings, floats of ice, or shores benumbed with frost: where not the Greenland bear, nor the morse, nor the whale inhabits, thither retreat many kinds of birds; only disturbed by the apprehension of too long night, and only quitting the extremes of the globe, as darkness spreads itself around their dwellings. To enjoy a few hours of light, they follow the sun with reluctance, and with joy precede his annual visits to their polar abodes.

Water-fowl are peaceable among themselves, and have no tyrants of their own kind to dread; but often their chace proves dangerous, and, instead of taking their prey, they become victims: large fish draw them under water; whales, and cachalots, open the gulphs of their enormous throats, not only for shoals of herrings, or mackarel, but for flights of birds that follow them. Water-fowl have among them no birds of song; for what is melody among the waves? What the modulations of Philomel herself among the boisterous roar of the agitated deep? Loudness and strength that may be audible from afar, though less brilliant, are most useful.

Water-fowl are always most plenty where fish abounds; and often two sides of an island shall be remarkable, one for the abundance, the other for the scarcity, of birds, from this cause.

Few water-fowl, in proportion to other kinds, are tamed; and those which man has adopted, are rather captives than domestics; for being incapable of bearing confinement, they enjoy a partial liberty, if no more,

and by means of it retain most of the marks which belong to their native state; nor do they form, by any means, the varieties and cross breeds that land-birds do; but are capable of returning sooner to their wild state, as being less distant from it.

Between land-birds that shun the water, and water-fowl that inhabit it, nature has placed a numerous tribe of a middle nature, whose divided toes indicate a residence on land, but whose appetites attach them to the streams; living among waters, yet incapable of swimming, their long legs fit them for wading, and their long bills for groping, in shallows.

Birds habituated to marshy places, may be known by the scaly surface of their legs; most also are bare of feathers half way up the thigh; all of them above the knee; their habits of wading continually in moisture preventing the growth of feathers on those parts.

The bill of this class is, in general, long, and in some finely fluted on every side; its point possesses extreme sensibility, being furnished with nerves for the better feeling their food. Some have long legs, for wading; long necks, for stooping; long bills, for searching; and nervous points, for feeling. Others have long bills, but moderate legs; others long necks, but short legs. Where a bird's legs are long, the neck is also long; no bird is so defective in conformation, as to stand upon stilts above its food, without possessing an instrument to reach it. They live on fish, or insects, a few excepted; even those called mudsuckers probably feed on worms.

Such are the general habits of amphibious birds. Quitting these for water birds, of manners truly aquatic, we come to those whose first great distinction appears in the toes, which are webbed together by broad skins, so that they expand two broad oars to the water; and, moving them alternately, swim with the greatest facility; the toes, by striking backward, beat the water with their broadest hollow surface; but when advancing for a second blow, their front surface contracts, and offers no resistance against the fluid to impede the birds progress.

Web-footed birds have very short legs; were the leg long, its motions would be slow and laborious. They have a closer, warmer plumage than birds of any other class; are also furnished with an animal-oil, that glazes their surface, and keeps each feather separate. This oil contributes also to their warmth in the watry element. They abound with fat, so that, by the warmth of their feathers externally, and this natural lining internally, they are better defended against the weather, than other classes.

Some water-fowl prey by sudden stoops from above, to seize what fish come near the surface; others, not furnished with wings long enough for flight, take their prey by diving.

After these hints, we divide aquatic birds into (1) those of the CRANE kind, or such as are amphibious, and frequent banks and streams, rather than extensive waters; (2) those of the GULL kind, with long legs and round bills, that fly along the surface to seize their prey; (3) those of the PENGUIN kind, that, with round bills, short legs and wings, dive after their prey; (4) those of the GOOSE kind, with flat broad bills, that chiefly subsist on insects and vegetables.

The gull kind are active and rapacious, constantly on the wing; with sharp straight bills for piercing, or hooked at the end for holding, their fishy prey. In this class we include the albatross, the cormorant, the gannet or solan goose, the shag, the frigate bird, the great brown gull, and all the lesser tribe of gulls and sea-swallows.

The penguin kind, with wings short, and bodies large, can neither run nor fly, but are formed for diving; their feet are placed so far backward, and their legs so hid in the abdomen, that the slightest stroke impels them head foremost in the water. To this class we may refer the penguin, the auk, the skout, the sea-turtle, the bottle-nose, and the loon.

The goose kind are distinguishable by their flat broad bills, covered with a skin; and by their manner of feeding, which is mostly on vegetables. In this class we comprise the swan, the goose, the duck, the teal, the widgeon, and their numerous varieties.

T H E C R A N E

IS a tall, slender bird, with a long neck and long legs; the top of the head covered with black bristles, thinly scattered, especially on the back, which thereby seems bald, and is red in the male; which sufficiently distinguishes this bird from the stork, to which it is very nearly allied in size and figure. The plumage in general is clear ash-coloured; except the tips of the wings and the head; and there are two large tufts of feathers that spring from the pinion of each wing. These bear a resemblance to those in the sides of the ostrich; the quill feathers are black, and

and are finely curled at the ends; the bird has a power of erecting and depressing them at pleasure. The crane varies in size, from three feet high, to four and even five feet, from tip of the bill to the toes. The naked part of the leg is about four inches, the feet are black, ten or eleven inches long; bill four inches, straight, pointed, compressed on the sides; blackish green in colour.

The crane is a very social bird, and seldom seen singly; they assemble in flocks of fifty or sixty; while part feed, others stand like sentinels; ever wandering, and greatly subsisting on corn and vegetables, but partly also on reptiles; and is known in every country of Europe (except our own); from north to south; and even to Ethiopia. They generally leave Europe about the latter end of autumn, and return in the beginning of summer; crossing the inland parts of the continent in flocks of fifty or an hundred, flying chiefly in the night.

In these journeys they ascend amazing heights; their note is the loudest among birds, and is often heard in the clouds, when they are unseen. Light for its size, and spreading a large expanse of wing, it is capable of floating, where the air is lightest, in tracts too fatiguing for other birds. Though unseen themselves, they have distinct vision of objects below; they direct their flight by their cries.

The cold arctic regions seem to be this bird's favourite abode; in the southern parts they are rather visitants than inhabitants.

The peculiar clangor of their voice arises from the extraordinary length and contortion of the windpipe; from the throat it enters through the flesh into the breast-bone, which has a great cavity within to receive it; there being thrice reflected, it goes out again at the same hole, turns down to the lungs, and enters the body a second time.

They rise heavily, are very shy, and seldom let the fowler approach them. Their depredations are usually made in the darkest nights, when they enter a field of corn, and trample it down. They choose some solitary marsh, where to range themselves by day, as if in deliberation; and not having grain, wade the marshes, for insects and other food.

In general is a peaceful bird, both at home and abroad; is easily tamed, and taught postures and dances.

The female is distinguished from the male, by not being bald behind; lays two eggs at a time, like those of a goose, but blueish. The young ones are soon fit to fly, and then their parents forsake them; previously leading them to where their food is most easily found. Though unfledged, they

they run so swiftly that a man cannot easily overtake them. As they grow old, their plumage becomes darker : they are very long lived ; that of Leonicus Thomeus lived with him forty years.

Their various manners of flying indicate changes in the weather ; always set a centinel when on the earth during night ; vigilant, even to a symbol ; all (except the centinel) sleep, the head under the wing.

White cranes are sometimes found, but rarely.

South of the tropics are cranes, as in these northern parts, of the same appearance, and probably of the same manners.

In America a white crane (a constant race), but its great quill feathers of the wings black, is stronger made, larger headed, and longer billed, than the European cranes.

THE STORK

RESEMBLES the crane in bill, neck, legs, and body, but is something smaller, and something more corpulent ; in colour the stork is glistening white and brown, or black on its wings ; the nails of its toes are peculiar, not clawed like those of other birds, but flat like the human. Feet and bill red ; its long neck bent ; around the eyes a naked wrinkled skin, blackish red. Rudiments of a membrane between its toes.

The stork is silent, except a noise caused by clacking its under chap against the upper : its windpipe has no convolution through the breast-bone, but is formed as usual : preys entirely on frogs, fishes, birds, and serpents. When flying, holds forward its head stiff ; while its legs, extended backward, are also stiff, as if serving for a rudder. When resting, stands on one leg, its neck bent backward, and its head resting on its shoulder ; is easily familiarized, is cleanly, has a dejected aspect, yet is often lively, and frolics with children, leaping and playing ; is long lived, lives always in or near towns : lays generally four eggs, dirty white and yellow.

Are birds of passage ; quit Europe in August ; travel to Egypt, Belon says, in troops of four or five thousand. Kempfer says they are stationary in Japan. All assemble on a particular day, and leave none of their company behind. Take their flight generally in the night : generally return in the middle of March ; nestle on the tops of chimneys and houses, as well as of high trees : always return to the same nests ; if the nest is de-

stroyed, build another in the same place. Male and female sit upon their eggs by turns; are a month in hatching; are particularly solicitous for the safety of their young: these, unable to stand on their thin and feeble supports, draw themselves along in the nest on their knees. Belon asserts that they breed also while in Egypt.

The Dutch are very solicitous for the preservation of the stork in their republic. This bird builds on the tops of their houses without molestation, and is familiar in their streets. There are few towns on the continent, in low marshy situations, but have the stork among them.

Is said to maintain its parents, when infirm by accident or age; and to give a kind of token at parting, and at returning to its nest.

The BLACK STORK is rather brown, than black; changing by reflection to violet and golden green; a lively red skin round the eyes; red bill; wild and solitary; flies from habitations, and frequents marshes and deserts, or the deep recesses of the woods. Nests on old trees, high pines, by the sides of lakes; besides fish, feeds on insects; found in the Alps, and Germany; is supposed to migrate: the species is rare; seems to avoid where the white stork prefers.

The MAGUARI inhabits the hot climates of America; and seems to be representative of the species in the new world.

The COURICACA, ill denoted by the title *wood-pelican* (since it has little in common with the pelican), inhabits Guyana, Brasil, and South America. In size equals the stork, higher mounted on its legs, and having a longer neck; has a hard, strong, thick, and large bill: plumage brown, black, and white: his throat capable of extension, but nothing like the bag of the pelican. Is a bird of passage; frequents Carolina at the close of summer; haunts marshes.

T H E I B I S.

THE ancient Egyptians worshipped the IBIS, a bird in appearance between the crane and curlew; the moderns referring it to the latter kind, the ancients to the former. That man should at any time, or on any occasion, worship brutes, is only to be accounted for on principles heretofore hinted; and by remarking that, while second causes were elevated to the station of the great First Cause, there were no limits whereby the influence of so dishonourable and detrimental a principle could be confined.

The white Ibis

The Jabiru.

The Ibis was serviceable to the Egyptians, by ridding their country of serpents; and still continues the service, having particular delight in killing reptiles of all sorts, even when satiated with food. There are two kinds; the black, which is very scarce; and the white, which is common. The white is rather less than the stork, about three feet and a half in length, legs long and naked, face and forehead without feathers, bill arch'd, the tips of the wings and tail black; the rest of the plumage white; the bill is yellowish, roundish, and terminates bluntly; the head, eyes, and throat are covered with a wrinkled skin; the sides of the bill are sharp, cutting, and hard enough to cut serpents; which probably is the manner in which the bird destroys them. The legs are red, scaly; the nails pointed, narrow, blackish; rudiments of membranes; tongue very short; globe of the eye small.

Known to be the ancient Ibis by the bills remaining in some pots of mummies, and by the bones of the leg. Being held in esteem in Egypt, frequents towns, and lives freely, wandering at pleasure in the streets. Nests on palm trees, and among tufts of prickly leaves, to prevent the attack of cats: lays four eggs; sits four weeks: this relation to the four phases of the moon, and the black and white plumage of the bird, occasioned it to be consecrated to Isis (i. e. the moon). Is long lived: the Egyptian priests shewed to HERODOTUS one which was *so old*, as they said, *it could not die*.

The *Black Ibis* is smaller than the white, and not so long legged; in the rest resembling the former.

In Egypt, &c. are cranes, storks, hawks, kites, and falcons, all equal enemies to serpents, and that devour a vast number. The modern ibis is not peculiar to Egypt; and some persons have even thought that the true ibis is a bird of the vulture kind, called the capon of Pharaoh, which not only is a devourer of serpents, but will follow the caravans that go to Mecca, to feed upon the offal of the animals that are killed on the journey; of somewhat like which we have a hint in JOSEPHUS, though much disguised, relating to the ibis: but these birds have not the same relation to Isis, as the true ibis has, and which seems to fix it to the bird we have described.

T H E J A B I R U.

THE JABIRU is the largest bird of the crane kind; much higher than the crane itself, and double its size; in body exceeding the swan.

Inhabits the borders of the rivers Amazons and Oroonoko, where reptiles abound in prodigious numbers. Here the strength of the jabiru is but proportionate to the size of the serpents which it has to destroy; and its height to the depth in which it has occasion to wade. Its bill is thirteen inches long; three broad at the base, black, sharp, cutting, flat on the sides, hard as horn, slightly incurvated upward; the neck strong, thick as a man's arm; the head, and two thirds of the neck, covered with a naked black skin; on the summit a few grey hairs. The skin at the bottom of the neck, four or five inches high, is of a bright red, and forms a large and handsome collar to the bird, whose plumage is white. Legs strong, covered with black scales, and partly without feathers; a small membrane between the toes; the tail is large, extends not beyond the wings when closed; inhabits marshes and lakes; its flesh dry, but not bad; is very fat in the rainy season.

The Nандапоа is a smaller jabiru; resembling the former in its head and neck, but differing by its bill being arched downward, and being only seven inches long. The bird is about equal to the stork in size: summit of its head grey and bare, even bony: eyes black; ears large, and very open; wings and tail black; plumage white; flesh good eating, after taking off the skin. Called the jabiru *guacu*, or large jabiru, where the former is not known.

THE KAMICHI.

THE KAMICHI; so called in Guyana; in Brazil, the *Anbima*; in Amazonia, *Cabuitabu*, from his cry, (which is so loud as to terrify into silence all birds and reptiles, its neighbours, as it echoes along the waters); others express it *vyhoo vyhoo*; is a water-fowl, feeding on serpents and reptiles; bigger than a swan. The head, which is small for the size of the body, bears a black bill, which is not above two inches long; the upper mandible longest, and a little pointed; a horn growing from the forehead, three or four inches long, ending in a sharp point, bending forward, sheathed at its base, thicker than a crow-quill, as round as if it were turned in a lathe, and of an ivory colour: the head and neck frizzled, with very little feathers. At the fore part of each wing, and at the second joint, spring two straight triangular spurs, about as thick as one's little finger: the uppermost of these spurs is the largest, two inches long, a little bent at the end, and is sheathed at its base; the hinder is shorter, sheathed also; and both of a dusky colour. The claws also are long and sharp; general

The Kamichi.

The Secretary.

general colour brown, black, and white. Notwithstanding these arms, never attacks birds, but reptiles only. Wings and tail very long; the feet covered with very strong scales; toes very long; the middle toe, including the nail, five inches; the nail hooked, hollow beneath; toe behind resembling that of a lark: he walks with his head high, and his neck erect. They are never found alone, but in pairs, prowling together; and their fidelity is said to be such, that, when one dies, the other never departs far from the carcase, but wanders groaning around the place, and dies with its companion. It makes its nest of clay, at the foot of trees, on the ground, in shape like an oven: haunts the forests, but especially marshes and savannas, where the reptiles grow to enormous sizes.

THE SECRETARY, OR MESSENGER,

IS among the most remarkable of birds, as well in form as manners; has long legs, like waders in general, yet a hooked bill like birds of prey. He seems to exhibit an eagle's head, on the figure of a crane. Full the height of a crane, and the size of a turkey-cock. On the head, neck, back, and covert of the wings, grey, inclining to brown, becoming lighter in front; wings and tail black, black waved with grey on the legs; a packet of long feathers, like wing feathers, hang behind his neck; most of them six inches long, black, some shorter, and some grey; all are slender near the quill, broad at their ends. The leg is almost bare of feathers; the toes short and thick, that behind very strong; nails crooked; the neck is thick, bill strong, and divided beyond the eyes; the upper mandible hooked like the eagle, pointed and cutting; the eyes are placed in a naked orange-coloured skin, extending beyond the exterior angle of the eye, and originating from the base of the bill: has also eye-lashes, of one row of black hairs, three quarters of an inch long, which, being a peculiarity of an extraordinary kind, contributes much to the singularity of the bird itself. Though armed by a bill proper to birds of prey, yet he is timid; and often, to elude the attacks of even a weak enemy, leaps eight or nine feet high: gentle and lively, he becomes easily familiar, and, when brought up young from the nest, is domesticated; and actually at the Cape of Good-Hope is serviceable in destroying rats, lizards, serpents, &c. When the bird finds a serpent, he attacks him by blows with his wings, to weaken him; then seizes him by his
tail,

tail, raises him a great height in the air, and by repeated falls beats him to death. When running he spreads his wings, and is often seen thus running and flying at once. Nests in bushes, some feet from the ground; lays two white eggs, with rusty spots; when disturbed, croaks; is not dangerous, but mild. He eats meat greedily, does not refuse fish. When reposing or sleeping, crouches on his belly: some of his cries resemble some of those of the eagle. His ordinary exercise is to walk swiftly, backward and forward, a long time without stopping; whence his name of *Messenger*: as that of *Secretary*, from his feathers, as it were, stuck like a clerk's pen behind his ears. Diverts himself by throwing up a straw frequently: when approached, he is fearful; but soon recovers his gaiety, and becomes curious. While the designer was drawing him, he came several times to inspect the portrait, stretching out his neck, and erecting his neck feathers; often also spreading his wings: when prompted by great curiosity, erects his neck feathers very high; was never seen to drink; to eat at his ease, he half lies down; his greatest strength seems to be in his feet, by a blow of which he will kill a chicken, or a rat, for which he will watch assiduously before its hole; prefers living animals to dead, and flesh to fish. Is but lately known at the Cape of Good-Hope; inhabits the interior of Africa: also the Philippine Islands. In some, the neck feathers are frizled; some have two long feathers in the tail, probably the male.

THE CARIAMA

SURPASSES the heron in size; lives on the banks of waters, and marshes; has long feet, and naked legs, but a bill short and hooked like birds of prey: carries his head high; his neck is long; at the base of his bill, which is yellowish, is a feather resembling an aigrette; his plumage resembles that of a hawk, being greyish, waved with brown. His eyes are bright gold-colour, having long black eye-lashes; his feet yellowish; toes united at their origin by a partial membrane; the middle toe longest (nail short and rounded); the hind toe placed so high, as not to reach the ground; heel thick and round, like that of the ostrich. The voice of this bird resembles that of the turkey-cock, is loud and audible from afar; his flesh is tender and delicate; is thought not incapable of domestication. Inhabits South America.

THE

CROWNED AFRICAN CRANE

IS pretty nearly the shape and size of the ordinary crane, with long legs and neck, but the bill shorter; colour of the plumage dark greenish grey; the bill, feet, and legs black. The head and throat form the most striking part of this bird's figure. On the head stands up a compact round crest of silken bristles, flat, and spiraled, spreading every way like diverging rays, the longest ray about three inches and a half; on each grow, standing up, very small hairy feathers, black, pointed, and topped with a kind of black tassels, which give them a beautiful appearance. A large wattle of a membranous skin, white on the temples, bright scarlet on the cheeks, surrounds his face, and descends under his bill; on his head a fine down; the eyes large and staring; the iris white, the pupil black and big, surrounded with a gold-coloured iris that completes the bird's very singular appearance. Beautiful feathers of a deep leaden black colour hang down his neck, and spread on the shoulders and back; the first feathers of the wing are black, the others reddish brown; its voice resembles the crane.

When running, stretches out its wings, and goes very swiftly, but its usual motion is slow: when domesticated, walks very deliberately among poultry, and is gentle and peaceful. At Cape Verd is half-domesticated, and comes freely to eat grain among the poultry; is even displeased when solitary too long; loves to be visited and spoken to. They seldom roost in houses; but, when disposed to go to rest, perch on some high wall in the manner of a peacock, which bird they so much resemble in some of its manners and disposition, that several authors have called them the sea-peacock. Has been supposed, erroneously, to be the Balearic crane of Pliny: neither corresponds to his hint, nor is found in the Balearic Islands, but inhabits the Gold Coast, Cape Verd, &c. Its habits and food resemble the crane kind: loves to bathe itself; loves fish, insects, &c.

THE NUMIDIAN CRANE

IS vulgarly called by our sailors the Buffoon Bird; by the French, the Demoiselle; very closely resembles the crane in figure and colours. When performing its gesticulations, after making sundry reverences, rises, lifts one wing, then another, turns round, sails forward, then back again; walks with a good air and ostentation, often bounds and leaps gaily, as if it would dance: has been called the actor, the mimic; has great vanity; loves to shew its feats; prefers applause to its food, and follows spectators in hopes of further inspection. Has two tufts of fine white feathers, consisting of long, delicate, almost hairy fibres, which fall from the sides of the head, forming a kind of head-dress, about four inches long; the summit of the head covered with long and soft black feathers, reclining, while the fore part of the neck is adorned with black feathers, composed of very fine long and silky fibres, that hang down upon the stomach, and give the bird a very graceful appearance: under the wings also depend long and flexible tufts of feathers. Might perhaps be naturalized in Europe, as it has lived and bred here, though a native of the Tropics.

THE SPATULA OR SPOONBILL.

THE Spoonbill differs much from the crane, yet approaches this class more than any other. The European spoonbill is about the bulk of a heron; but shorter in the legs. Neck furnished with small feathers; those of the back of the head fall down the neck; its eyes are surrounded with a naked skin; the feet, and naked part of the legs, are covered with a black skin; a partial membrane unites the toes.

Its common colour is a dirty white; those of America are of a beautiful rose colour, or crimson, and larger than the European; its bill, which is very particular, is about seven inches long, and spreading at the end, to three times the width of the bill, terminating in a hooked point, as its name denotes; it is there upwards of two inches wide; the upper mandible seems to comprize the whole forehead, it is so large. This instrument in some is black, in others of a light grey, or yellowish, barred black; in those of America, is red, like the body. Round the upper chap runs a kind of rim, with which it covers that beneath; within it has a long gutter, in the upper mandible; the substance of this bill is not hard, but flexible like leather; its tongue is not half an inch long, is triangular: the windpipe has a double inflection.

The Spatula *or* Spoon-bill.

The Flamingo.

Inhabits the sides of the sea, lakes, and marshes; feeds on frogs, toads, fish, shell fish, aquatic insects, and worms, and throws up the shells after digesting the flesh; also on serpents, of which, particularly at the Cape of Good-Hope, they destroy great numbers. The inhabitants esteem them as formerly the ancient Egyptians did their Ibis: he runs tamely about their houses; a useful, if not a beautiful companion.

This bird breeds in Europe, in company with the heron, in high trees; and in a nest formed of similar materials. Willoughby mentions a certain "grove, at a village called Seven Huys, near Leyden, where they build and breed yearly in great numbers. Here, also, the heron, the bittern, the cormorant, and the shag reside, and annually bring forth together. Here the crane kind seem to have formed their general rendezvous; and, as the inhabitants say, every sort of bird has its several quarter, where none but their own tribe are permitted to reside. Of this grove the peasants make good profit." It is now destroyed.

The spoonbill is very noisy in hatching-time; lays three to five eggs, white, powdered with a few pale spots. The species is spread throughout the world, but is no where numerous.

THE FLAMINGO.

THE Flamingo is the most remarkable of all birds resembling the crane, the tallest, slenderest, and most beautiful. The body scarce equals that of a swan; but its legs and neck are so long, that when erect it exceeds six feet high. Its wings, extended, are five feet six inches from tip to tip; and it is four feet eight inches from tip to tail.

Its plumage is bright scarlet, or flame-coloured (whence its name), some spots deeper, some lighter; the tips of the wings constantly black, their upper parts remarkably vivid scarlet; this colour gradually extends to the back, the rump, the breast, and on to the neck; the upper part of the neck, and the head, are covered with down; only the top of the head is bare of feathers.

Its bill is of a very extraordinary form, seven inches long, flat, and very strongly turned downwards at half its length; his head and throat seem swelled to support this bill, especially the inferior mandible; the superior mandible is rather longer than the inferior, to *include* it; the edges of both are furnished with a row of sharp small teeth, turning backwards; this bill is in its first part black, in its bent part red, but this

varies; its upper chap is supposed to be moveable. The legs and thighs are not much thicker than a man's finger; about two feet eight inches high; its neck near three feet long. The feet are not furnished with sharp claws, but feeble, and partly united by semi-membranes; the bird is never seen swimming, its legs and thighs being sufficient for bearing it into those depths where it seeks for prey.

This extraordinary bird is found in Italy, Spain, all over Africa, and in America; wanders, but confines its wanderings to warm climates. In America, or where molested, they chiefly keep near deserted shores, near salt-water lakes and swampy islands. They come down to the banks of rivers by day, and often retire to the mountainous parts at night; in the day they appear drawn up in a long close line of two or three hundred together; and, as Dampier tells us, present, at the distance of half a mile, the exact representation of a regiment of soldiers, or a long brick wall. Their rank is broken when they seek for food; but they appoint a centinel, whose duty is to give notice of danger, while the rest feed. As soon as this trusty centinel perceives the remotest appearance of danger, he screams, with a voice loud and shrill as a trumpet, and instantly the whole cohort are on the wing: they feed in silence; but now all the flock are in chorus, and fill the air with intolerable screaming.

In Africa they assemble by thousands, perch on the trees within and about villages and dwellings, and are very clamorous; the sound is heard at near a mile distance. The Negroes consider their society as a gift of Heaven. In some places they are shot by mariners; their young, which run excessively fast, are often taken with nets. When their long legs are entangled in the meshes, they cannot escape; but they continue to combat; and the old ones, though seized by the head, will scratch with their claws, and often do mischief. Of all delicacies the flamingo's tongue is the most celebrated; a feast, says Dampier, for an emperor! In fact, the Roman emperors thus considered it; and we have an account of one, who procured six hundred flamingos' tongues to compose a single dish. This tongue is larger than that of other birds, is black and gristly; a lump of fat at its root is much admired.

Their cry sounds like the word *Tococo*, from whence the Canadian Indians have named them. In their flight they appear of as bright a red, as a burning coal. Their manner of feeding is singular: the bird thrusts down its head, so that the upper convex side of the bill shall only

couch

touch the ground ; in this position he appears, as it were, standing on its head. In this manner it paddles its feet, to attract the water, mud, &c. and their inhabitants ; and moves the bill about, and seizes whatever fish or insect happens to offer. They eat small fishes, shell-fish, fish-spawn, and water insects, where there are plenty. When tame, eat bread, &c. which they soak in water ; fear cold, and come so close to a fire as to scorch their legs ; sleep standing on one leg, the other drawn up under the belly, the head turned back under the opposite wing.

Their time of breeding is according to the climate ; in North America they breed in our summer ; on the other side the line they take the most favourable season of the year. They build their nests in extensive marshes, and where secure from surprize. The nest is raised from the surface of the pool about a foot and a half, formed of mud scraped up together, and hardened by the sun, or the heat of the bird's body : it resembles a truncated cone, or one of the pots which we see placed on chimneys ; on the top it is hollowed out ; in this cavity the female lays her eggs, without any lining but the well-cemented mud that forms the sides of the building. She lays two eggs ; and as her legs are immoderately long, she straddles on the nest, while her legs hang down, one on each side, into the water ; her body, properly speaking, does not enter the nest, but rather her rump, while her tail covers it.

The young are long before they fly, but they run with amazing swiftness : they suffer themselves to be carried home, and are tamed very easily ; in five or six days they become familiar, eat out of the hand, and drink a surprising quantity of sea-water, which is indispensable to them ; but are not reared without great difficulty ; generally pine away for want of their natural supplies, and die in a short time. While young, their colours are very different from the lively tints of their kind. In the first year their plumage is white, mixed with grey ; in the second year the whole body is white, with here and there a slight tint of scarlet ; and the great covert feathers of the wings are black : the third year the bird acquires all its beauty.

THE

HERON, AND ITS VARIETIES.

THE Heron may be distinguished from the crane and stork, as well by being much less, as by its bill, which is much longer in proportion; but especially by the middle claw on each foot being toothed like a saw.

Brissón has enumerated not less than forty-seven sorts, differing in size, figure, or plumage. In fact, the kind is numerous, but of uniform manners; cowardly and rapacious, indolent, hungry, excessively destructive and voracious, yet ever of lean and carrion bodies.

The common heron is remarkably light in proportion to its bulk, scarce weighing four pounds; yet, wings expanded, is five feet from tip to tip. Its bill is very long, being five inches from the point to the base; its claws long, sharp, and the middlemost toothed: thus armed, yet indolent and cowardly, it flies at the approach of a sparrow-hawk. Is very melancholy when taken old, and even refuses food; but, if taken young, may be domesticated.

Of all birds, commits the greatest devastation in fresh-waters; scarce a fish, though ever so large, that he will not strike at and wound, if unable to carry it away. But the smaller fry are his chief subsistence; these, pursued by the larger fishes, take refuge in shallow waters, where they find the heron a still more formidable enemy. He wades as far as he can into the water, and there patiently waits the approach of his prey. "I have seen a heron," says Willoughby, "shot, that had seventeen carps in his belly; these he will digest in six or seven hours, and then to fishing again. I have seen a carp taken out of a heron's belly nine inches and a half long." Several gentlemen who kept tame herons, to try what quantity one of them would eat in a day, have put several small roach and dace in a tub, and they have found him eat fifty in a day, one day with another. In this manner a single heron will destroy fifteen thousand carp in a single half year.

In general, he is seen through a telescope, for he suffers no approach, but is very shy; fixed in his gloomy solitary stand by the lake-side motionless; his long neck usually sunk between his shoulders, his head turned on one side, as if eying the pool intently. Thus he stands early and late, and often so steady, that it seems doubtful whether it is an animated

The Heron

mated being; though sometimes half frozen and covered with icicles, flies in the night, and is heard at all seasons. When flying stiffens his legs, lays his neck on his back, folded so that below the bill seems to grow out of the breast; rises very high, and flies flat. In cold or stormy seasons, his prey is no longer within reach: the fish now keep in the deep, as the warmest situation; frogs and lizards also, of which he devours many, abide closely in their lurking-places; and the heron is obliged to have recourse to patience, and to take up with water-weeds.

Often he hovers over shallow places, where he darts on his prey with certainty; for though the fish at sight of its enemy instantly descends, yet the heron, with his long bill and legs, pins it securely to the bottom, then rises on the wing, with a trout or an eel struggling in his bill: the greedy bird, however, flies to the shore, scarce gives it time to expire, but swallows it whole, and then returns to fishing as before.

Nestles on the tops of the highest trees in the forest or the grove, sometimes on cliffs hanging over the sea; where they love each other's society, and build in company. The female lays four large eggs of a pale green: their nests are made of sticks, and lined with wool: often seize one from the rook, the crow, or the owl, which they enlarge. Heronries are not unfrequent in France, where the flesh of the young is in estimation. It was formerly much esteemed in England, and a favourite dish at great tables. It was even said the flesh of a heron was a dish for a king; at present, nothing about the house will touch it but a cat.

The young are numerous, voracious, and importunate; the old ones ever on the wing to provide for them. Is very long-lived, exceeding sixty years, but by how much is not known.

There is a *white* heron, the size of the former, his bill yellow, feet black. Also a *black* heron, a *blue* heron, and several of other colours.

The *Aigrette* is of the heron family, and distinguished by long silky feathers on his back, used to form ornaments for the head-dresses of ladies, knights, and sultans. They rise from each shoulder in a tuft, which extends beyond the tail; are snow-white; bill and feet black; the bird about two feet high. Is found also in America; also another of double the size; as are several varieties of the heron kind, very large and very small.

T H E O P E N - B I L L.

THERE is a strange bird of the heron family (in shape at least), whose peculiarity is denoted by his name; his bill is, in fact, *open* and *gaping* during two-thirds of its length; the upper and lower mandible equally bending outwards, leave between them a large vacancy, and only join at the tip of the bill: the bird inhabits India; has the leg and feet of a heron; his wing feathers black; the rest of his plumage clear ash-colour; his bill blackish at the root, the rest white or yellowish, thicker and larger than the heron's; size of the bird fourteen or fifteen inches. His manners unknown.

T H E B I T T E R N

IS famous for its sonorous voice, which resembles the bellowing of a bull, but hollower and louder, as if issuing from a cavern, or from some formidable enemy being resident at the bottom of the waters; the females run to this cry, sometimes a dozen; he struts round them, and drives off intruders.

Is not so big as a heron, with a weaker bill of the same form; very deeply divided beyond the eyes; four inches long; shorter legs; its neck closely set with feathers, thereby seeming thicker; throat capable of great extension; bill and feet greenish; toes long: differs also in colour, which is generally palish yellow, spotted and barred with black. To produce the sound for which it is remarkable, the lower part of its wind-pipe, at dividing into the lungs, is supplied with a thin loose membrane, capable of holding a large quantity of air, and exploding it at pleasure. These explosions are heard from spring to the end of autumn.

It hides in the sedges by day, and calls in the evening, booming six or eight times, *br-rhond*, then discontinuing for ten or twenty minutes, then renewing this peculiar sound, audible at above a mile distant; but only when undisturbed and at liberty. When its retreats are invaded, it is silent: in domestic captivity, under the control of man, it is mute, and never utters this call; is incapable of attachment or instruction. It screams generally upon seizing its prey, and sometimes through fear. When attacked, defends himself by striking at the eyes; conquers birds
of

is thought to be a bird of passage ; is rare. Lives on insects, as well as frogs and fishes ; hides itself during day, flies at night, croaking *kaw kaw* ; has long toes ; feet and legs yellowish green ; bill black, slightly arched ; eyes bright ; the iris forms a red or orange-coloured circle round the pupil.

THE SAVACOU

INHABITS Guiana and Brasil ; has much the shape and size of the night-raven ; resembles him also in manner of life, which is the same as the heron family ; but is singular by his bill, which resembles two spoons meeting each other by their concave parts : the upper mandible has on its convex part two *groovings*, which separate the nostrils ; these are prolonged to the middle, and form a rising, which terminate by a crooked point. The inferior mandible receives the superior, and, as it were, frames it, being covered with the skin of the neck : both mandibles are cutting at their edges, of a very hard horny substance ; the bill four inches long : the bird never uses this powerful weapon to molest others, but in watery savannas : perched on projecting branches, he waits the passing of fish, on which he darts, and instantly rises : he walks in a strained attitude, his neck bent, and his back humped : is wild, and keeps aloof from habitations. His eyes being near the root of his bill gives him a savage air. When taken, he clatters his bill, either in anger or fear, and erects the long feathers on the top of his head. Some are grey, some brown ; both have naked necks, whose skin seems capable of extension : yellowish toes, thin and long ; tail short, and does not exceed the wings when folded.

THE AVOCETTA OR SCOOPER.

THE avocetta is chiefly found in Italy, but passes into the north, and most parts of Europe, and now and then comes over into England. It is about the size of a pigeon, is a pretty upright bird, and has extremely long legs for its size, seven or eight inches long, which are the more remarkable, as web-footed birds have short legs. But its singularity of figure is the bill, which turns upward. This extraordinary

The Avocetta

1770/1771

bill is thin, weak, black, flat, sharp, and flexible, tender and almost membranous at the end, and about three inches and a half long; incapable of defence or effort.

From its being bare a long way above the knee, it appears that it lives and wades in waters of a few inches depth, in deeper it swims; is very lively and alert; is very wandering, often passing but one day in a place: when started from its nest, shams remarkably lame; is very difficult to take; is spread over Europe, yet is rare. It has a chirping, pert note, we are told; it is web-footed.

It is difficult to conceive how this bird lives, with so feeble and seemingly so ill-adapted a bill; the softest mud seems too troublesome, if not too hard, for so weak an instrument to stir. It is supposed, therefore, to feed on worms, and on the spawns of fishes which float on the water. Its stomach contains only a gelatinous matter, and sometimes parts of insects, always mingled with small crystalline pebbles.

Its plumage is snow white in front, chequered with black on the back; tail white, feet blue.

The CORRIRA or RUNNER, of ALDROVANDUS, has the longest legs of all web-footed fowl, except the flamingo and avocetta; the bill is straight, yellow, black at the end; pupils of the eyes surrounded with two circles, one bay-coloured, the other white; below, near the belly, it is whitish; the tail, with two white feathers, black at the extremities; the upper part of the body rust colour; runs very fast, whence its name; inhabits Italy. Thus we see the flamingo, the avocetta, and the runner, have the long legs of the crane kind, yet in their almost-webbed feet, approach the direct water-classes.

OF

SMALL BIRDS OF THE CRANE KIND.

THIS list comprises the CURLEW, about the size of a capon, with a bill uniformly bending downwards, five or six inches long: the WOODCOCK, under the size of a pigeon; bill three inches long: the GODWIT, of the same size; bill four inches: the GREEN-SHANK, longer legged; bill two inches and an half: the RED-SHANK, differing in colour of its feet from the former: the SNIPE, less by half; bill three inches.

With

With shorter bills—The RUFF, a collar of feathers round the neck of the male; the KNOT, the SAND-PIPER, the SANDERLING, the DUNLIN, the PURRE, and the STINT.

With bills very short—The LAPWING, the GREEN PLOVER, the GREY PLOVER, the DOTTREL, the TURNSTONE, and the SEA-LARK. These, with their affinities, are natives or visitants of this country, its shores, rivers, and marshes. The foreign birds of this kind would extend the list to above an hundred.

All these birds are bare of feathers above the knee; and some half way up the thigh. This is partly natural, and partly produced by habitually wading in water. The older the bird, the barer its thighs; yet even the downy covering of the young ones does not reach so low as in birds of other classes. They run with great swiftness for their size, and the length of their legs assists their velocity: they are equally swift of wing, and traverse immense tracts of country without much fatigue.

All birds of this class live on animals of one kind or another. The long-billed birds suck up worms and insects from the bottom; those furnished with shorter bills, pick up such insects as lie nearer the surface of the meadow, or among the sands on the sea-shore.

The CURLEW, the WOODCOCK, the SNIPE, are ever seen in plashy brakes, under covered hedges, seeking insects in their worm state. Their bills are long for searching, but are further endowed with exquisite sensibility at the point, for feeling their provision. They are furnished with three pair of nerves, equal almost to the optic nerves in thickness; which pass from the roof of the mouth, and run along the upper chap to the point.

The LAPWING, the SAND-PIPER, and the RED-SHANK, run with surprising rapidity along the surface of the marsh, or the sea-shore, quarter their ground with great dexterity, and leave nothing of the insect kind that happens to lie on the surface.

These birds seem ever employed, seldom rest by day; and, during night, every meadow and marsh resounds with their calls to courtship or to food. They seem provided by nature, with a warmth of constitution to fit them for the cold element. They reside, by choice, in the coldest climates; and, as other birds migrate here in summer, their migrations hither are mostly in winter. Those that reside among us the whole season, retire in summer to the tops of our bleakest mountains; where they breed, and bring down their young, when the cold weather sets in.

The

The CURLEW, the WOODCOCK, the SNIPE, the GODWIT, the GREY PLOVER, the GREEN and the LONG-LEGGED PLOVER, the KNOT, and the TURNSTONE, are rather the guests than the natives of this island. They visit us in the beginning of winter, and forsake us in the spring. They then retire to the mountains of the north. Their weak and delicately pointed bills are unfit to dig into a resisting soil; and their prey is departed, were they able to reach its retreats. The coldest mountains of the north are then a preferable habitation; the marshes there are never totally dried up; and the insects are in abundance, both above ground and underneath.

The LAPWING, the RUFF, the REDSHANK, the SAND-PIPER, the SEAPIE, the NORFOLK PLOVER, and the SEA-LARK, breed in this country: yet wander on some occasions to the northern climates; especially when our summers are peculiarly dry.

In nestling and bringing up their young, one method takes place universally. As all run and feed on the ground, all nestle there; their number of eggs is from two to four; the nest is made without art; the eggs are laid in some little depression of the earth, or on a few bents and long grass that scarcely preserve them from the moisture below. Yet such is the heat of the body of these birds, that their time of incubation is shorter than with any others of the same size.

Such are the general habits of this class of birds; as several of them have however peculiar and remarkable manners, we shall notice some more particularly.

THE WOODCOCK

IS famous as excellent game: is rather a stupid bird, and caught with no great difficulty: comes over in the beginning of winter; if it does not forsake a country, retires to the mountains, where it resides and breeds during summer; returns to the moist plains in winter. The first severe frosts or snow oblige it to descend: commonly arrive in the night, or in a foggy day, few together; never in troops: alight on thick hedges, and prefer where many leaves have fallen; here they hide by day; in twilight quit their retreat, to seek humid spots. When followed by the sportsman, flies briskly, but not far; plunges behind bushes, and drops as suddenly as lead; instantly runs a little way; but stops, holds up his

head, and looks around him, to see that all is safe, before he thrusts his bill into the earth. It is suspected, that though this bird's eyes be large, he sees best by twilight, his movements being by much the briskest morning and evening; even those kept in a room, though quiet during the day and night, yet regularly took flights morning and evening. At full moon is very vigilant; feeds on worms; does not scratch the earth with its feet, but turns leaves, earth, &c. with its bill, briskly to right and left; is thought to seek its food by smelling. In size, equals the partridge. Dogs never eat woodcocks; probably disliking their scent. The young run very soon: the old ones have been seen to carry a young one when pursued: the male never quits the female, while the young are with her; is silent except in breeding-time. Sits with the female, and both seem to enjoy laying their bills on each other's back. The species is greatly spread. There is a white woodcock.

THE SNIPE

GREATLY resembles the woodcock in appearance; and indeed might almost, without impropriety, be called the *Little Woodcock*: but the snipe does not frequent woods; but is confined to marshes, and watery places: flies so high as to be invisible, yet is heard; having a little cry like a kid, *mee, mee, mee*: never resides on mountains: is of passage; comes in winter, goes away in spring. The snipe is continually piercing the earth, yet nothing is found in his stomach but earthy *residuum* and liquid; probably the substance of the worms it eats is thus melted. The tip of its tongue is sharp, to pierce such prey. Hides itself carefully among reeds by day. The species greatly spread throughout the world.

The JACK-SNIPE is but half the size of the former: is called by some *deaf*; for it hides closely among reeds, and never stirs till almost trod upon, as if it heard nothing of its pursuer. Is less of passage than the former.

The DUNLIN differs a little in plumage, but nothing in manners.

in full Feather

moulted

The Combattant

THE COMBATANT,

OR FIGHTER, called also (the male) the *Ruff*, and (the female) the *Reeve*. In the beginning of spring, when these birds arrive among our marshes, the males engage each other with desperate fury; not only singly, but also in troops, regulated and orderly, marching one against the other. The males are said to be more numerous than the females: these spirit up the warriors, await at hand the issue of the war, and reward the victors with their company; and the conquered, if they hear the cry of fresh females, again enter the lists, if opposed. They are thought to come from the north.

This bird furnishes a remarkable instance of variation at different periods. Their ruff begins to shew itself soon in spring, and subsists only during the season of courtship: the same is observed of the eruption of a multitude of little fleshy pimples, full of blood, which rise on the forepart of the head, and round the eyes; the whole together forming a total dissimilarity in the same bird. This ruff moults off at the end of June, the pimples flatten and disappear, and their places become covered with feathers; then both sexes are alike.

In Lincolnshire they are taken in great numbers, and are fattened for sale with bread and milk. To keep them quiet they must be shut up in darkness; for if light, though but little, be admitted, they fight. Among other birds in an aviary, they challenge all round: if there be a green turf in a corner, they fight for its possession; and, as if they were ardent for glory, they fight with especial fury in the presence of spectators. Their ruff serves for defence, they erect it when fighting; it is of various colours in various birds; rarely white, often dark coloured.

THE LAPWING

SEEMS to have taken his name from the sound of his wings, which somewhat resembles the noise of falling wheat, in fanning. Has a tuft, consisting of five or six thin, long, black shafts, falling behind on his neck. Is very lively; perpetually in motion, and frisking as well in the air, as when on the ground. Comes in the spring; visits the fields of green

corn, and marshes. Having cleared away from the hole where a worm is lodged, the little rolls of earth which the worm ejects, and thus opened the hole, he strikes with feet, and stands stock still, accurately watching: this slight commotion alarms the worm, and prompts him to quit his retreat; but the moment he appears, the Lapwing seizes him. When the worms come out in the evening, to enjoy the fresh dew, the Lapwing running in the grass, feels them with his feet, and thus secures them.

When they first arrive they are in flocks; but they soon separate, and pair, after a few battles among the males. The young females expose their nests more than the older. The arts of the Lapwing to divert men or dogs from her nest, are perfectly amusing: if she perceives the enemy approaching, she boldly runs to meet them; when as near them as she dare venture, she rises with a loud screaming before them, seeming as if just flushed from hatching; while she is probably a hundred yards from the nest. Thus she flies, with great clamour and anxiety, whining and screaming round the invaders, and fluttering as if wounded. To add to the deceit, she appears more clamorous, as more remote from the nest. If there be dogs, she flies heavily at a little distance before them, as if maimed; vociferous and bold, but never offering to move toward the quarter where her treasure is. The dog pursues, in hopes every moment of seizing the parent, and by this means actually loses the young; for the cunning bird, when she has thus drawn him off to a proper distance, then puts forth her powers, and leaves her astonished pursuer to gaze in vain.

THE OYSTER-CATCHER

FREQUENTS the sea-side, feeds on sea-worms, oysters, limpets, and other shell-fish, which he gathers on the sands. He is always found on the beach, or on reefs of rocks, dry at low water; there he carefully watches the flux and reflux of the tide, never straying far from the shore: he has also been called the SEA PIE, as well because his plumage is black and white, as because, like the Pie, he is in continual clamour, especially when in a troop; but the name seems misapplied: the species is greatly spread throughout the world; is the size of a crow; his bill four inches long, is narrowed, and as it were compressed, above the nostrils, and flat on the sides, having some resemblance to an old-fashioned hatchet;

hatchet; which structure adapts his bill to detach from the rocks, or to raise from the sands, those shell-fish which compose the food of this bird. He has only three toes, little or no membranes; yet sometimes swims, following the course of the water, resting on it, or quitting it, at his pleasure; probably eats worms, like others of this class; yet in his stomach are usually found oysters or their parts. She lays her eggs on the sands, above high water mark, without any preparation; lays five or six eggs: quits them during the middle of the day. Of this bird the bill and feet are coral red; feet and toes scaly and hard; eye-lids red, iris yellow; tail short.

THE TURNSTONE.

HIS manners are well expressed by his name; for his custom is to turn all the stones he sees on the water edge, in hopes to find under them worms and insects on which he feeds; he turns them by the force of the upper part of his bill, very quickly, even though they weigh two or three pounds, which, in a bird the size of a thrush, expresses great strength, and great dexterity; his bill is of a very hard substance, is very thick at the base, though sharp at the point; its upper part is a little compressed, and slightly turned upwards; is black; about an inch long; feet orange-coloured; plumage black and white. The species is pretty much spread.

THE WATER-OUZEL

SHOULD with justice be detached from among the Ouzels; for though his size be nearly like theirs, his plumage dark, and his breast white (as are some ouzels), yet he is silent, slow in his movements, neither bounding nor hopping; he frequents the clear streams of high mountains, preferring those whose descent is rapid, and whose beds are rocky and stony; he is found near torrents, cascades, and limpid streams, which run over gravelly strata; he enters the water wholly, gradually, without plunging, walking in it at the bottom, and following the inclinations of its bed; strolling at his ease, as if on land; letting his wings drop, and shaking them; here he feeds on little fish and water insects. His

feet resemble those of the ouzel kind; his nails are short and hooked; bill short and thin; his plumage is thick, oily, downy, and impenetrable by the water; tail short: nestles by the side of a stream; makes his nest of moss, covered at top like an oven.

THE RAILS

ARE a numerous family, inhabiting the marshy sides of lakes and rivers, especially if covered with water-weeds. This is the constant disposition of Water Rails; the Land Rail inhabits meadows: all have the body thin, compressed on the sides, little or no tail; small head; bill almost like a cock, but longer.

The WATER RAIL runs along the sides of standing waters as quick as the Land Rail does among grass; he is always hid among rushes, and only quits his retreat to cross the lake, swimming or running, for often he runs lightly over the large leaves of the water-plants; he makes paths among such herbage, and by these goes and returns; he keeps very closely in his hidings, and is not without great difficulty made to quit his rushes; and flies, as the last resource: about the size of the Land Rail; bill longer; reddish near the head; feet obscure red, sometimes yellow; belly and sides striped transversely white upon black; under parts grey slate colour; upper parts brownish red, approaching to olive.

The PEARLED RAIL is but the size of a lark; his plumage brown olive, spotted and clouded with white; hides and nestles in the rushes: its nest in form resembles a *gondola*; is composed of reeds interwoven, and firmly attached to some tuft of rushes, so as to rise and fall with the stream; the young, the moment they are disclosed, run, swim, and dive; and soon separate, for this bird is solitary at all times; is, like all Rails, so hard to start, that the sportsman may sometimes take it with his hand, or strike it with a stick. The kind is spread generally, and in the marshes of America exceeds the European.

The Jacana

T H E J A C A N A

HAS been by some referred to the kind of Water-hens, but though resembling in manners, yet in figure, and other particulars, is very distinct, having spurs to each wing, and a membranous kind of *comb* on his head. The toes and nails excessively long; that behind as long as the middle one before; all the nails round, sharp, and piercing; whence some have called him *Surgeon*. Inhabits the marshes of Brazil and Guyana, feeding on water-insects, &c. There are three or four species of this bird, which differ in colours, not in size.

In one species, the head, neck, and front are black, with a tint of violet; the great wing-feathers green; the rest of his upper part chestnut, verging on purple; each wing is armed with a sharp spur issuing from the shoulder: from the base of the bill rises a membrane, which falls over the forehead, divides into three parts, and falls on each side of the bill; the bill is straight, a little swelled at the end, of a bright yellow, as are his spurs; the tail short; his legs half way bare of feathers. In size less than a pigeon; but his long legs and neck make him seem larger. Go ordinarily in pairs, and, when accidentally separated, clamour after each other; are very wild, and only to be approached by art. Visit St. Domingo, not only after the great rains in May and November, but some are seen after any heavy rain, whence it is concluded, that their residence is not distant. Their flight is low, but rapid; their cry is audible from afar, and has some affinity to an owl's; so that poultry in the yards are frightened by it: yet is not known to be of prey. Some are greenish black; some have the green reflections of the Pigeon.

THE PORPHYRION, OR SULTANA HEN,

WAS well known to the antients, but, till lately, lost to the moderns. The first of the kind submitted to examination came from Madagascar, but it has since been found to breed in Sicily, in the lake *Lentini*. This bird is gentle, innocent, timid, fond, seeking solitude and betwixt places, hiding itself when eating, when approached has a sharp cry, ending internally. Prefers fish, but eats fruits and roots; can live on grain; often soaks his food, repeatedly; if the piece be somewhat large, he grasps it in one foot, and, holding it half way to his mouth, eats it in morsels;

morsels; for his legs are longer in proportion than his neck is, according to the general make of birds. His plumage is blue, soft, and shining, with splendid reflections; his feet long, and a kind of flat piece on his head, bare of feathers, as it were a large scale; the base of his bill is of a beautiful red; a tuft of white feathers at the tail sets off his blue plumage. The female resembles the male, but is rather less; not quite equal to a Hen in size. This beautiful bird has all the qualities requisite to domestication, and was domesticated among the Romans, but for shew only. Lays six white eggs, round; dusts itself like the Cock; its toes are very long; no membranes. Male and female assist in making the nest.

THE KING-FISHER

EXHIBITS the beautiful plumage of the peacock, the shadings of the humming bird, the bill of the crane, and the short legs of the swallow.

Not much larger than a swallow; shape clumsy; legs disproportionably small; bill disproportionably long; two inches from the base to the tip; the upper chap black, and the lower yellow; the crown of the head and the coverts of the wings are of a deep blackish green; spotted with bright azure; the back and tail are of the most resplendent azure; the whole under-side of the body is orange-coloured; a broad mark of the same passes from the bill beyond the eyes; beyond that a large white spot; the tail is short, and consists of twelve feathers of a rich deep blue; the feet are of a reddish yellow, and the three joints of the outmost toe adhere to the middle toe, while the inner toe adheres only by one; which is a singular conformation.

Is for ever on the wing, and feeds on fish; frequents the banks of rivers; and takes its prey, in winter especially, by balancing at a certain distance above the water for a considerable time, then falling like lead into the water, and seizing the fish with inevitable certainty. While suspended in the air, in a bright day, the plumage exhibits a beautiful variety of the most dazzling and brilliant colours; but he often sits on a projecting branch or stone, watching the water.

The King-fisher with which we are acquainted at present, though most likely the ancient Alcyon, has none of those powers of allaying the storm, or building upon the waves, with which fable furnished it anciently; but

but is contented to make its nest on the banks of rivers, in such situations as not to be affected by the rising of the stream. When it has found a place for its purpose, it hollows out with its bill a hole about a yard deep; or if it finds the deserted hole of a rat, or one caused by the root of a tree decaying, it takes quiet possession. This hole it enlarges at the bottom to a good size, lining it with the down of the willow, and partly closing the opening. Here are found great quantities of bones and scales of fishes, the remains of the bird's food. The king-fisher, as Belon says, feeds upon fish, but is incapable of digesting the bones and scales, which he throws up again, as eagles and owls are seen to do a part of their prey; but this is not confirmed by some late observers, though it seems probable. In these holes, which from such remains are very foetid, the king-fisher is often found with five eggs to nine. There the female continues to hatch, even though disturbed; and though the nest be robbed, she will again return and lay there. She begins to lay early in the season, and excludes her first brood about the beginning of April. The male brings her large provisions of fish while thus employed; and, contrary to most other birds, she is found plump and fat at that season. The male, that used to twitter before this, now enters the nest as quietly and as privately as possible. The young ones are hatched at the expiration of twenty days; but are seen to differ as well in their size as beauty. These birds are not numerous; there are twenty species in the tropical climates of the old world, and seven or eight in the new.

THE WATER-HEN.

THE Water-hen is rather compressed on the sides of her body; the bill somewhat approaches the cock kind, but shorter; the forehead bare of feathers, and covered with a thick brick-coloured membrane, (as are some species of rails): flies with her feet hanging; has long toes, with a membranous border round them; legs long; thighs partly bare; wings short.

Resides entirely where her food lies; and never leaves the pond or river in which she feeds, along the grassy banks, and often along the surface of the water; does not swim far or much; but hides among the water weeds, and roots of aquatic trees, and only quits them in the evening, first covering her eggs, when hatching, with rushes and grass; she hides her nest very successfully, as also her young, which are rarely taken. She builds her nest on low trees and shrubs, of sticks and fibres, by the

water edge. Her eggs are sharp at one end, white, with a tincture of green, spotted with red. She lays twice or thrice in a summer; her young swim the moment they leave the egg, pursue their parent, and imitate all her manners. She rears, frequently, two or three broods in a season; and when the young are grown up, she drives them off to shift for themselves.

According to the season, forsakes or return to neighbouring mountains, descending in hard weather; the species is greatly spread. There are three races, distinguishable by their difference in size. Plumage iron-grey and white.

THE COOT,

THOUGH not entirely web-footed, is as good a swimmer as any bird whatever; and perhaps passes as much of its time on the water as any, except the Divers: is rarely seen on the land, or, if seen there, is so out of its element that it may be taken with the hand; flies and seeks its food at night; and, like many water birds, sees distinctly in obscurity; keeps in rivers, and among rushy margined lakes. It there makes a nest of such weeds as the stream supplies, and lays them one on another, without order, among the reeds, floating on the surface, and rising and falling with the water. The reeds keep it fast; so that it is seldom washed into the stream; but if this happens, the bird sits in her nest, like a mariner in his boat, and with her legs steers her cargo into the nearest harbour: there she continues to sit in great tranquillity, regardless of the impetuosity of the current; and though the water penetrates her nest, she hatches her eggs in that wet condition.

When disturbed in her retreat, hides among the rushes, and even in the mud, rather than take to flight; the young are playful, and not so circumspect, which exposes them to the destructive pounces of the buzzard; they often dive so instantly as to escape the shot fired at them. In early winter they assemble in lakes, and, though chased by boats, only fly from side to side of the lake, by which obstinacy many hundreds are killed: lays eighteen or nineteen eggs, hatches in twenty-two or twenty-three days; the young directly leap into the water, and never re-enter the nest; are then black and downy; the white crest-like surface on the head scarcely discernible. This substance is a prolongation of the upper layer, which composes the upper mandible; this is soft and almost fleshy at the base. Plumage black, in size equals a hen; its feet have a large membranous border, scolloped; lives on water-insects, small fish, &c. sometimes eats grain: their flesh is black.

T H E - G R E B E

IS distinguished by a tippet, and a plumage which unites to the softness, closeness, and thickness of down, the springiness of feathers, and the lustre of silk; especially the plumage of the breast is a compact, smooth, regular layer, forming one uniform surface, impenetrable both to cold and wet; by this substantial clothing, the bird is enabled to sustain the most rigorous winters, though constantly on the waters. The feet of this bird have a membrane, which is divided, and cut into scollops round each toe; his legs are placed very much backward, and he takes his flight with very great labour, to which he is with difficulty excited; and endeavours to avoid it, swimming always against the wind. On land is easily caught, yet defends himself well with his bill; in the water is as active and alert, as heavy on land; swims; dives, and floats admirably; pursues fish to great depths; and is often taken in nets; frequents equally salt water, and fresh rivers, and lakes. The size of a Coot; about one foot six inches from bill to tail: nearly two feet from bill to toes; plumage deep shining brown on the back; the front of most silvery white; head small; bill strait, sharp; a little red skin round the eye, wings short, voice strong; foot spread, and flatted, covered with scales; nails large and flat; no tail but a rump; is generally very fat; eats weeds as well as fish; nestles on rocks, near the sea; but around lakes makes a nest of rushes and reeds, floating on the water, and fastened to some secure station.

The *tufted* Grebe is ornamented by a plume from the back of his head, falling behind, capable of elevation and depression; is larger than the common Grebe. The *little* tufted Grebe differs, in that his tuft *divides*, as does that of the *horned* Grebe; he has also a kind of mane, or staring hair, red at the root, black at the point, surrounding his neck, which gives him a strange wildness of air: he is larger than the common. There is a less of this kind.

The *chestnut-coloured* Grebe, is not only distinguished by his colour, but by being among the smallest birds that navigate the ocean; he frequents also rivers, especially in winter, when he is very fat; eats small fish, and small shell-fish.

The name of this family, in many parts of England, is DOB-CHICK: the species inhabits most parts of the world.

THE ANHINGA

IS among the most remarkable of birds by its form, which suggests the idea of a reptile mounted on the body of a bird: its neck excessively long and thin; its small cylindric head, sharpened into a long pointed bill, resembles the figure and also the motions of a serpent, as well in the manner of the bird's suddenly thrusting forward his neck when quitting a tree, as in his manner of striking at fish, when in the water; the head and neck are covered with down, close set, and soft as velvet; the eyes are brilliant black, the iris golden, a naked skin surrounds them; the point of the bill is furnished with small jagged points turning backward; the body is about seven inches long; the neck alone is double that length; the tail is large, formed of twelve spreading feathers, unlike most water-birds; yet the anhinga swims and dives, holding its head above water; but this it withdraws on the least appearance of danger; is very wild; never taken on the shore; is always on the water, or perched on the tops of the highest trees along the sides of rivers, or drowned savannas, where he nestles; is among the number of birds perfect palmipeds, or having toes completely united by a membrane; the nail of the middle toe dentelated internally like a saw. Its skin is very thick; its flesh not eatable, but very fat; its plumage mingled with grey; its wings are long, the colours of some reddish. Found principally in America, but some in Africa.

THE PELICAN.

THE Pelican is among the largest of water-birds; much larger in the body than a swan, and somewhat of the same shape. Its four toes are all completely webbed together, are red or yellow; and its neck in some measure resembles that of a swan: its singularity is its bill, and the great pouch underneath. This enormous bill is fifteen inches from the point to the opening, which is behind the eyes; at the base is somewhat greenish, but varies towards the middle and end, being reddish. It is flat at top, very thick in the beginning, but tapers off to the end, where it hooks downwards. The under-chap is still more extraordinary; it consists of two flexible branches, which divide to accommodate the size of the pouch which hangs to it, reaching the whole length of the bill to the neck, and said to be capable of containing fifteen or twenty quarts of water;

The Anhinga.

The Pelican.

ter; is large enough to contain a man's arm or head. This bag the bird has a power of wrinkling up into the hollow of the under chap; but by opening the bill, and putting one's hand down into the bag, it may be distended at pleasure. The skin of which it is formed is a blueish ash-colour, with many fibres and veins running over its surface. Is not covered with feathers, but with a short downy substance, as smooth and as soft as satin. When this bag is empty it is not seen; but when the bird has fished with success, it is often incredibly dilated. The first thing the pelican does in fishing is to fill up this bag; and then it returns to digest its burthen at leisure. It is composed of two skins, one the outside skin of the neck, the internal that of the gullet. When the bird swallows his prey, this bag is closed by two muscles, to prevent the water passing into the gullet; also, to prevent suffocation, the wind-pipe quits its usual place, and is projected. The nostrils are very small, placed at the root of the bill.

Its legs are short, but its wings extend eleven or twelve feet, and are capable of raising it great heights; at these elevations he balances nicely, and falls plump on his prey, striking the water with his whole extent of wing, making it foam, and dashing so as to confound the fish: thus one proceeds when single; when in troops they range in a line, or swim in a circle, *closing* on the fish. They fish morning and evening. It is pleasant to see them rise several feet above the water, their pouches half full, then dart again for more. To digest their food they fly to some rock, where they sit with their heads laid on their shoulders: at night perch upon trees. Are very unclean and filthy; their flesh smells insufferably. Preys in fresh water as well as at sea; yet avoids marshes, but frequents dry countries, as Arabia and Persia, where it is called *water-carrier*, for he carries to her nest her pouch full of water. The Egyptians call it *River-camel*, from the same circumstance.

The bird preys upon fish of seven or eight pounds weight, and hides them by dozens in its pouch. Du Tertre affirms, that it will hide as many fish as will serve sixty hungry men for a meal. It is said it will eat rats, &c.

This bird weighs twenty-four or twenty-five pounds, yet its skeleton not one pound and a half; his bones are so thin they are transparent: the air which enters this bird, is conveyed manifestly and evidently even into the quills of his feathers, filling a cellular membrane, which surrounds the whole body under the membrane whence the feathers grow, insomuch that, by pressure of the parts, the escape of the air is remarkable.

able. Probably other birds have the same powers in various degrees, but not so traceable.

Its amazing pouch may be considered as analogous to the crop in other birds, with this difference, that as theirs lies at the bottom and within the gullet, so this is placed on the outside, and under the bill; it has no digestive heat. She brings the fish *fresh* to her young; to discharge its contents, presses the pouch on her breast. At the bottom of its bag is a tongue, but so small that many have said it had none. When tame is very thievish in fish-markets. Eats sideways, and catches what is thrown to it.

The pelican, says Labat, has strong wings, furnished with thick plumage of an ash-colour, as are the rest of the feathers over the whole body; on the neck a short down; on the nape of the neck longer, forming a small tuft. Its eyes are very small, when compared to the size of its head, which is flattish on the sides; its cheeks naked; its countenance and its air melancholy. Torpid, inactive and gluttonous.

The female drops her eggs on the bare ground to the number of five or six, and there continues to hatch them. She feeds her young with fish from her bag; and, when they cry, flies off for a new supply.

The Americans kill vast numbers, to convert their large bags into purses and tobacco-pouches, dressing the skin with salt and ashes, rubbing it well with oil. It thus becomes so soft and pliant, that the Spanish women sometimes adorn it with gold and embroidery to make work-bags of.

Father Raymond assures us, he has seen one that would go off in the morning at the word of command, and return before night to its master, with its great paunch distended with plunder; part of which it was made disgorge, and part it reserved.

“The pelican,” as Faber relates, “is not destitute of other qualifications. One of those which was brought alive to the Duke of Bavaria’s court, where it lived forty years, seemed to be possessed of very uncommon sensations. It was much delighted in the company and conversation of men, and in music, both vocal and instrumental; for it would willingly stand,” says he, “by those that sung or sounded the trumpet; and stretching out its head, and turning his ear to the music, listen very attentively to its harmony, though its own voice was little pleasanter than the braying of an ass,” whence the Greeks named it *onocrotalos*. Gesner tells us, that the emperor Maximilian had a tame pelican which lived for above eighty years, and that it always attended his army on their march.

march. It was one of the largest of the kind, and had a daily allowance by the emperor's orders.

THE CORMORANT.

THE Cormorant in size nearly equals a goose, but is rather slender; its four toes are completely united by membranes together; the middle toe being toothed or notched like a saw, to assist it in holding its fishy prey. The bill is straight, till near the end, where the upper chap bends into a hook; plumage black, or variegated with deep brown; two white spots outside of the legs; front of the neck white; tufts of long feathers on the head and the upper part of the neck; front and sides of the head bald; a naked skin accompanies the bill beneath.

This unclean bird combines, with the grossest appetites, the most rank and disagreeable smell. More fœtid than carrion; its form disagreeable; its voice hoarse and croaking; all its qualities obscene:—No wonder Milton should make Satan personate this bird, when surveying the beauties of paradise, on the basest of purposes.

It is seen as well by land as by sea; fishes in fresh-water lakes, as in the ocean; builds in the cliffs of the rocks, as well as on trees; and preys not only in the day-time, but by night.

The cormorant is trained up in China for the purpose of fishing, as it was formerly in England. The fisher carries them out into the lake, perched on the gunnel of his boat; at the first signal given, each flies a different way, to fulfil the task assigned. It is very pleasant, on this occasion, to behold with what sagacity they portion out the lake or the canal. They hunt about, they plunge, they rise an hundred times to the surface, until they have at last found their prey. They then seize it with their beak by the middle, and carry it without fail to their master. When the fish is too large, they give each other mutual assistance: one seizes it by the head, the other by the tail, and in this manner carry it to the boat together. There the boatman stretches out one of his long oars, on which they perch, and being delivered of their burthen, they fly off to pursue their sport. When they are wearied, he lets them rest for a while; but they are never fed till their work is over. They have always, while they fish, a string fastened round their throats, to prevent them from

devouring their prey, as otherwise they would at once satiate themselves, and discontinue their pursuit the moment they had filled their bellies."

The cormorant is the best fisher of all birds; and though fat and heavy, is generally on the wing. The great activity with which it pursues, and from a vast height drops down to dive after its prey, offers one of the most amusing spectacles; it is often seen rising heavily, with a fish larger than it can readily devour. It sometimes also happens, that the cormorant has caught the fish by the tail; and consequently the fins prevent its being easily swallowed in that position. In this case, the bird is seen to toss its prey above its head, and very dexterously to catch it, when descending, by the proper end, and so swallow it with ease.

THE ALBATROSS.

THIS bird is thus described by Edwards: "The body rather larger than that of a pelican, and its wings ten feet from tip to tip; bill six inches long, yellowish, terminates in a crooked point. Top of the head bright brown; back dirty deep spotted brown; the belly, and under the wings white; the toes, which are webbed, flesh colour.

Inhabits the tropical climates, and the Streights of Magellan in the South Seas. Is one of the most fierce and formidable of the aquatic tribes, not only living upon fish, but also such small water-fowl as it can take by surprise. It preys, as all the gull kind do, on the wing; and chiefly pursues the flying-fish, that are forced from the sea by the dolphins; pursues the gulls, and obliges them to relinquish their prey.

Few birds float upon the air with more ease than the albatross, or support themselves longer in that element. They, night and day on the wing, are always prowling, yet always emaciated and hungry. Seem to have a peculiar affection for the penguin, and a pleasure in its society. Choose the same places of breeding; some distant uninhabited island, where the ground slants to the sea, as the penguin is not formed either for flying or climbing. At Falkland Islands they build with amazing uniformity; their nests covering fields by thousands, and resembling a regular plantation. In the middle, on high, the albatross raises its nest on heath sticks and long grass, about two feet above the surface: round this the penguins make their lower settlements, rather in holes in the ground; and most usually eight penguins to one albatross.

SMALLER

The Pipal.

SMALLER GULLS AND PETRELS.

OF the Gull, properly so called, there are above twenty kinds; of the Petrel three; and of the Sea-swallow several. The gulls may be distinguished by an angular knob on the lower chap; the petrels by their wanting this knob; and the sea-swallow by their bills, which are straight, slender, and sharp-pointed. They all, however, agree in their appetites and their places of abode.

The gull is well known in this kingdom. Is sometimes seen slow-sailing, hovering over rivers to prey on fish; sometimes following the plowman in fallow fields to pick up insects; and, when living animal food was absent, has been known to eat carrion, and whatever else offered, as if it were the vulture of the aquatic tribes. Round our boldest rockiest shores they appear in the greatest abundance; there the gull breeds and brings up its young; and there millions are heard screaming with discordant notes for months together. The rocks offer them a retreat for their young, the sea a supply of food, and renders the place inaccessible from below. These are the situations to which sea-fowl chiefly resort, and bring up their young. These birds, like all of the rapacious kind, lay but few eggs; and hence, in many places, their number is daily seen to diminish: lay from one egg to three, in a nest formed of long grass and sea-weed. Most are fishy-tasted, with black-stringy flesh; yet the young ones are better food: and these, with several other birds of the penguin kind, the poor inhabitants of our northern islands make their food.

THE FRIGATE-BIRD

RECEIVES his name from the swiftness and manner of his flight. In fact, of all sea-birds, he has the most powerful and durable flight, and extends his course to greater distances than any other bird. His wings are prodigiously long, and his motion smooth; he seems to swim in the air, till the instant his prey appears, then he darts like lightning upon it. When the sky is tempestuous, he rises above the clouds,

clouds, and seeks serenèr skies, at elevations where he is beyond our sight. Ever on the wing, he flies night and day. Those fish that go in shoals (as the flying-fish, &c.) are pursued by dolphins, bonitos, &c. these he discerns from amazing heights, and notices the track of a column with the greatest accuracy : often the shoal is so large as to agitate the water, and so closed together as to whiten it ; then the frigate-bird, skimming along the surface, seizes with his bill, or his claws, or both, those fish which offer. Is principally found between the tropics in both hemispheres : tyrannizes over the Boobies, and makes them yield their prey ; is a very bold bird ; has sharp claws ; long hooked sharp bill ; short, strong feet, covered with feathers, like a bird of prey ; rarely is seen to swim, yet his feet are membraned ; like the boobies has no apparent nostrils, but has futures on his bill. About the size of a hen in body ; but his wings eight, ten or fourteen feet, from tip to tip. This excessive length of wing embarrasses the bird when about to rise from the ground, and obliges him to seek some small elevation, for on level ground he may be killed ere he can fly. Nestle on rocks, numbers together ; sometimes on trees ; lay one or two eggs, white stained with flesh colour, with dots of crimson. The young have a grey-white down ; their feet and bills white, but, when adult, their colours change, becoming reddish or black, and blueish in the middle. The head is small, and flat at top, the male has under his throat a membrane of a lively red, of the nature of wattles. Tail extremely forked. This, and their long wings, distinguish them. Plumage ordinarily black, with blueish reflections ; belly white, especially the females. Resembles the boobies in the naked skin around the eyes, and the dentated nail of the middle toe.

THE BOOBIES.

THESE birds seem to have received from nature but a partial share of that instinct, by which creatures in general are prompted to self-preservation : large and strong, armed with a bill sufficiently powerful, with long wings, and well-membraned feet ; they have all the necessary abilities to exercise their faculties, as well in air, as in water, yet they seem ignorant of what should be done, or should not be done, for self-defence. Spread generally in most climates ; yet in none have they learned

The Booby

learned to know their chief enemy; but suffer themselves to be taken, not only when at sea, resting on parts of ships, but on land, where they are killed in great numbers by blows with a stick; no one taking warning by observation of what happens to others, nor turning away from those who thus slaughter their companions. To what cause this must be attributed is unknown: the difficulty of putting in motion their wings, in order to rise, which some suggest, seems inadequate to this purpose. Not only man is their enemy; they are scarcely less persecuted by the frigate bird, who, darting upon them when flying, pursuing them without remission, and beating them with bill and wings, forces them to yield their prey, which is swallowed by their conqueror; for whom, perhaps, they labour a second time for other prey, in like manner taken from them.

The booby fishes by flying steadily over the water, and falling on the fish the moment he perceives it near the surface. They inhabit islands, even the most distant from other land. In form they pretty much resemble the cormorant; their bill is remarkable, in that the superior mandible is, as it were, articulated, and composed of three pieces, joined by two futures; that next the point giving somewhat the appearance of a nail to the tip of the bill; that next the head is so loose as to permit the former part of the bill to open two inches, without any motion in the under chap. Their cry is strong, between the crow and the goose; it is generally excited by fear. When flying, they stretch out the neck, and spread the tail: must have some little rising, from whence to take flight: they perch on trees. Dampier even says, they nestle on trees in the isle of *Aves*; elsewhere they nestle on the ground, multitudes together; lay one or two eggs; the young are long covered with a very soft white down.

The booby of the Antilles is less than a goose; about two feet five inches long, bill four inches and a half, the naked skin round the eye yellow; as also the base of the bill, its point brown; the feet pale yellow; the belly white; the rest of the plumage ash-coloured brown. One kind is white. The greater booby in size equals a goose; is six feet from tip to tip of its wings; plumage deep brown, sprinkled with white spots on the head; larger spots on the breast and back. Inhabits the coast of Florida. Dives deeply, and is thought to be often attacked and devoured by sharks and other voracious fishes.

THE GANNET, OR SOLAN GOOSE,

IS reckoned among the boobies; and is the size of a goose, but its wings six feet over; bill six inches long, straight almost to the point; the sides irregularly jagged, the better to hold its prey. Its colour is chiefly white; instead of nostrils, it has a long furrow, reaching almost to the end of the bill. From the corner of the mouth a narrow slip of black bare skin extends to the hind part of the head; beneath is another that is dilatable, and of size sufficient to contain five or six entire herrings, which, in the breeding season, it carries at once to its mates or its young; is sometimes choaked in swallowing too large a fish.

The skin of these birds is not closely adhering to the flesh, but is connected to it by little bunches of fibres, placed at unequal distances, as from one to two inches, and capable of extension, so that by blowing air into the skin it swells like a bladder; no communication between this interval and the thorax is discoverable; yet, doubtless, the air has passage, probably through the cellular membrane.

The islands to the north of Scotland, the Skelig islands off the coasts of Kerry, in Ireland, and those in the north sea off Norway, abound with them. But on the Bass island, in the Frith of Edinburgh, they are seen in the greatest abundance. In St. Kilda, Martin assures us, the inhabitants consume annually twenty three thousand young birds, besides amazing quantities of their eggs. On these they principally subsist.

The gannet is a bird of passage. In winter it seeks the more southern coasts of Cornwall, hovering over the shoals of herrings and pilchards that then come down from the northern seas: its first appearance in the northern islands is in the beginning of spring; and it continues to breed till the end of summer. But, in general, its motions are determined by the migrations of the shoals of herrings, which it assiduously attends in their passage, and keeps with them their whole circuit round our island.

Is possessed of a transparent membrane under the eye-lid, with which it covers the whole eye at pleasure, without obscuring the sight in the smallest degree. This seems necessary to secure the eyes of so weighty a creature, whose method of prey is by darting headlong from an height of an hundred feet into the water. Breed yearly, and lay but one egg,
which

which being taken away, they lay another; if that is also taken, then a third; but never more for that season. The young birds, during the first year, are of a dusky hue, speckled with numerous triangular white spots.

THE NODDY

IS in manners closely related to the boobies; but in size resembles the greater sea-swallow, to which class his bill is conformable; but he has the feet of the sea-mew. All his plumage is deep brown, except a kind of white cap on his head; like the boobies he alights on vessels, and even on the fist, if held out to him. Is found near the tropics, and between them. Are very numerous; during hatching time they prey together in great flocks; when that is past, each becomes solitary, and wanders at large over the vast ocean. Their eggs are good food; but must be sought in rocks at no little risk.

THE SEA-SWALLOWS, OR TERNS,

COMPOSE a small family of birds, which, in many respects, resemble the land birds of the same name. Their plumage is black and white; their wings very long and thin; their tails forked; their flight also is similar; agile, swift, and, as it were, wanton. They skim the surface of the water for their prey, and seize flying such little fish as they there catch. In other respects they differ; their feet have small membranes attached to the toes, and their bills are very distinct. Though seemingly capable of swimming, they are not fond of it, but dart down on the water, and instantly dart up from it. They live ordinarily on the banks of the sea, or rivers, or lakes. They are always chattering or screaming, and are extremely noisy in nesting-time. They frequent our coasts in spring, return in autumn. Some of them partly feed on insects: are bold birds; not frightened at fire-arms. Their legs are short, little adapted for walking, bare of feathers partly up the thigh; bill straight, narrow, pointed, smooth, and flattened on the sides. The kind is very greatly spread.

The great sea-swallow is thirteen inches from the bill to the toes ; sixteen to the end of the tail, wings extended two feet, his shape elegant ; his head black ; his upper parts grey ; his front white. They digest their food almost as soon as taken, for it melts in their gullet ; the lower part next the stomach first, even while perhaps the tail sticks out of the mouth. The female lays two or three eggs on the bare sands ; and it is remarked, that when the weather is warm, the egg first laid comes to maturity one day sooner than that laid second, as the second does one day sooner than the third : such effect has the warmth of the sand on those first laid : but if the weather be gloomy and chilly, no such effect occurs, but all three are hatched together. The young are covered with a thick down, and are perpetually crying for food, which the parents shower on them from on high ; are six weeks before they fly.

The little sea-swallow is but the size of a lark ; which is its constant, and almost only distinction from the former. There are several other kinds in foreign parts ; but closely allied in plumage and manners.

THE TROPIC BIRDS

ARE of natures very different from those which inhabit the extremes of the globe, and to which eternal snows are not only familiar, but friendly ; these, on the contrary, inhabit only the central division of the earth, nor ever quit the torrid zone, where the orb of day shines in full splendor : hence their appearance is to navigators a certain indication of their approach to the line, and the name of Tropic birds is imposed on them by general consent. They are found on the sea at vast distances from land, and on islands, remote from either continent, as well in the Atlantic Ocean as in the South Seas.

Besides a powerful and rapid flight, these birds have the faculty of reposing on the water ; and perhaps of sleeping on it. Their feet are entirely united by a membrane ; they can perch on trees ; they resemble sea-swallows in their length of wings, which cross each other over the tail when folded. Are about the size of a pigeon ; plumage strikingly white ; but are at once distinguishable by a long double shaft of feathers, as if a straw was stuck in its tail ; and from this some have given them the name of *straw-tails*. This double shaft is composed of two thin stems, each

each almost bare of feathers, and only having some short feathery beards. They are prolongations of the two middle feathers of the tail, which is, except these, very short, and scarce perceptible. These shafts are sometimes two feet long; they are moulted; and the inhabitants of Otaheite, &c. form ornaments of them for the casques of their warriors; while the Caribbees pass them through the *septum* of the nose, either to increase their beauty, or their terror.

This bird scarce can move on land. There are various sizes; some less than a pigeon, spotted with black on the wing-feathers next the body; a kind of horse-shoe mark over the eye. Some have red shafts, some have little streaks of black across the back.

THE PENGUIN KIND

AR E ill fitted for flight, and worse for walking. Their wings are short, scantily furnished with quills, and the pinion placed too forward, to be usefully employed. For this reason, the largest of the penguin kind, with thick, heavy bodies, cannot fly at all. Their wings serve them rather as paddles, when they attempt to move swiftly; and in a manner walk along the surface of the water. Even the smaller kinds seldom fly by choice. Their legs are still more awkwardly adapted for walking, all above the knee being hid within the belly; and nothing appears but two short legs stuck under the rump, upon which the animal is very awkwardly supported. Their short legs drive the body in progression from side to side; and were they not assisted by their wings, they could scarcely move faster than a tortoise; but this position of the legs adapts them admirably for a residence in water; and these birds, like Indian canoes, are the swiftest in the water, by having their paddles in the rear. Nor are they less qualified for diving; for by ever so little inclining their bodies forward, they lose their center of gravity, and every stroke from their feet tends to sink them the faster. In this manner they dive at once to the bottom, or swim between two waters, where they continue fishing for some minutes, and then ascending, catch an instantaneous breath to descend again to their operations. If they perceive themselves pursued, they instantly sink, and shew nothing more than their bills. Their lungs are fitted with numerous vacuities, by which they can take in a very large inspiration; and this probably serves them for a length of time.

Of this tribe, the Magellanic penguin is the largest, and the most remarkable. In size it is near a goose. It never flies, its wings being very short, covered with stiff hard feathers, and always hanging uselessly down by the bird's sides. The upper part of the head, back and rump, are covered with stiff black feathers; while the belly and breast are of a snowy whiteness, except a line of black crossing the crop. The bill, which from the base to about half-way, is covered with wrinkles, is black, but marked crosswise with a stripe of yellow. They walk erect, their heads high, their fin-like wings hanging down like arms; so that to see them at a distance, they look like so many children with white aprons. From hence they are said to unite in themselves the qualities of men, fowls, and fishes. Like men, they are upright; like fowls, they are feathered; and, like fishes, they have fin-like instruments, that beat the water before, and serve for all the purposes of swimming rather than flying. They feed upon fish; and seldom come ashore, except in the breeding season. In some the flesh is so tough, and the feathers so thick, that they stand the blow of a scymitar without injury. A small depression in the earth, without any other nest, serves for their laying. By the warmth of their feathers, and the heat of their bodies, incubation is carried on very rapidly. But in some places, the penguin burrows two or three yards deep; in others it clammers up the ledge of a rock, probably in consequence of dear-bought experience. The egg of the penguin is very large for the size of the bird, being generally bigger than that of a goose. There are many varieties of the penguin, differing in size from that of a Muscovy duck to a swan; the eggs differ in the same proportion.

OF THE

AUK, PUFFIN, AND OTHER BIRDS OF THE PENGUIN KIND.

OF a size far inferior, but of nearly the same form, and exactly the same appetites and manners, there is a very numerous tribe.

The great Northern Diver, is nearly the size of a goose: beautifully variegated all over with many stripes, and differs from the penguin, in being much slenderer and more elegantly formed. The grey speckled Diver does not exceed the size of a Muscovy duck; and, except in size,

The Diver.

greatly resembles the former. The Auk, which breeds on the islands of St. Kilda, chiefly differs from the penguin in size and colour. It is smaller than a duck; and the whole of the breast and belly, as far as the middle of the throat, is white. The Guillemot is about the same size; it differs from the auk, in having a longer, a slenderer, and a straighter bill. The Scarlet-throated Diver may be distinguished by its name; and the Puffin or Coulterneb, which is, by its bill, one of the most remarkable birds we know. The bill is flat; its edge upwards; of a triangular figure, ending in a sharp point; the upper chap bent a little downward, where joined to the head; a certain callous substance encompasses its base, as in parrots. It is of two colours; ash-coloured near the base, and red towards the point. It has three furrows, or grooves, impressed in it; one in the livid part, two in the red. The eyes are fenced with a protuberant skin, of a livid colour; and they are grey or ash-coloured. It is a small bird, not much bigger than a pigeon; when it once rises, it can continue its flight with great celerity.

The auk and guillemot, when they have once laid their single egg, which is extremely large for their size, seldom forsake it until excluded. The male, who is best furnished for flight, feeds the female during this interval; and so bare is the place where she sits, that the egg would often roll down from the rock, did not the body of the bird support it. The puffin, relying on its courage, and the strength of its bill, with which it bites most terribly, either makes or finds a hole in the ground, where to lay and bring forth its young.

At the latter end of March, or the beginning of April, come over a troop of their spies or harbingers, that stay two or three days, as it were to view and search out for their former situations, and see whether all be well. This done, they depart; and about the beginning of May, return again with the whole army of their companions. But if the season be tempestuous, they undergo incredible hardships; and are found, by hundreds, cast away upon the shores, lean and perished with famine.

The puffin, when it prepares for breeding, which always happens a few days after its arrival, begins to scrape up an hole in the ground, not far from the shore; and when it has some way penetrated the earth, it then throws itself upon its back, and with bill and claws thus burrows inward, till it has dug a hole with several windings and turnings, from eight to ten feet deep. It particularly seeks to dig under a stone, where it expects the greatest security. In some places, where rabbits breed, the puffin dispossesses the rabbits, and not unlikely destroys their young. Here young

puffins are found in great numbers, and become a very valuable acquisition to the natives. The old ones, at break of day, leave their nests, nor do they return till night-fall. Whatever fish, or other food, they have procured in the day, by night begins to suffer a kind of half digestion, and is reduced to an oily matter, which is ejected from the stomach of the old ones into the mouth of the young. By this they are nourished, and become fat to an amazing degree. When they are arrived to their full growth, they are dug out, or drawn out, from their burrows, with an hooked stick. They bite extremely hard, and keep fast hold of whatever they seize upon.

The Goosander is a bird, with the body and wing shaped like those of the penguin kind, but with legs not hid in the belly. It may be distinguished from all others by its bill, which is round, hooked at the point, and toothed, both upper and under chap, like a saw. Its colours are various and beautiful: its manners and appetites entirely resemble those of the Diver. It feeds upon fish, for which it dives; and is said to build its nest upon trees, like the heron and the cormorant.

OF BIRDS OF THE GOOSE KIND, PROPERLY SO CALLED.

THE Swan, the Goose, and the Duck, leaders of a numerous, useful, and beautiful tribe, we have reclaimed from a state of nature, and taught to live in dependance about us. The duck-kind approach the goose so nearly, that it may be proper to mark the distinctions.

The marks of the goose are, a bigger body, large wings, a longer neck, a white ring about the rump, a bill thicker at the base, slenderer towards the tip, with shorter legs, placed more forward on the body; both have a waddling walk; but the duck, from the position of its legs, is most waddling. The duck sometimes equals a goose in size, yet there are still other sufficient distinctions. Their having been tamed has produced alterations in each, by which they differ as much from the wild ones of their respective kinds as they do among themselves. In all the goose kind the bill is flat and broad, for the purpose of skimming ponds or lakes of the mantling weeds that stand on the surface; also they are sheathed with a skin which covers them all over. Eat insects, grais, corn, &c. These birds do not reject animal food when offered, yet subsist on vegetables, and seldom seek any other. They breed in abundance, and lead their

young to the pool the instant they are excluded. The swan was considered as a high delicacy among the ancients, while the goose was abstained from; but the goose is now the favourite; and the swan seldom brought to table, but for ostentation. At all times the duck was highly esteemed. There have been many changes wrought in their colours, their figures, and even their internal parts, by human cultivation. These birds, in a wild state, are simple in their colourings; but in the tame, no two are exactly alike.

OF THE SWAN, TAME AND WILD.

THE Swan has long been rendered domestic; and now we doubt whether there be any of the tame kind in a state of nature: The wild swan, though strongly resembling in colour and form, is yet different; for it is very differently formed within. The wild swan is less than the tame almost a fourth; this weighs twenty pounds, the other only sixteen; the tame swan is all white; the wild bird is, along the back and the tips of the wings, ash-coloured. In the tame swan, the wind-pipe sinks down into the lungs in the ordinary manner; but in the wild, after a contortion, like what we have seen in the crane, it enters a hole in the breast-bone; being reflected therein, returns by the same aperture; and, being contracted into a narrow compass by a broad and bony cartilage, is divided into two branches, which, before they enter the lungs, are dilated into two cavities. It is not easy to account for this difference of conformation; but it is more difficult to reconcile the accounts of the ancients with the experience of the moderns, concerning the vocal powers of this bird. The tame swan is very silent, the wild one has a note extremely loud and disagreeable; and such is its harshness, that the bird from thence has been called the Hooper. It is probable the ancients had some mythological meaning in ascribing melody to the swan.

Its chief food is corn, bread, herbs growing in the water, and roots and seeds which are found near the margin. It prepares a nest in some retired part of the bank, and chiefly where there is an islet in the stream. It is composed of water-plants, long grass and sticks; and the male and female assist in forming it with great assiduity. The swan lays seven or eight eggs, white, much larger than those of a goose, with a hard, and sometimes a tuberos shell. It sits near two months; its young are ash-coloured

coloured when they first leave the shell, and for some months after. It is not a little dangerous to approach the old ones, when their little family are feeding round them. After a twelve-month, which it takes to come to maturity, the young swans change their colour with their plumage. Some say it lives three hundred years; Willoughby seems to believe it. A goose, as he justly observes, has been known to live an hundred; and the swan, from its superior size, and from its harder, firmer flesh, may naturally be supposed to live still longer. We see multitudes on the Thames and Trent; but no where greater numbers than on the salt water-inlet of the sea near Abbotbury, in Dorsetshire.

OF THE GOOSE AND ITS VARIETIES.

THE Goose, in its domestic state, exhibits a variety of colours. The wild goose always retains the same marks: the whole upper part is ash-coloured; the breast and belly dirty white; the bill narrow at the base, at the tip black; the legs of a saffron colour; the claws black. These marks are seldom found in the tame, whose bill is entirely red, and whose legs are entirely brown. The wild goose is rather less than the tame; but both invariably retain a white ring round their tail, which shews that they are both descended from the same original.

The wild goose is supposed to breed in the northern parts of Europe; and, in the beginning of winter, to descend into more temperate regions. They fly at very great heights, in flocks from fifty to an hundred, seldom resting by day. Their cry is frequently heard when they are imperceptible above us; and this seems repeated among them, as among hounds in pursuit; but this they seldom exert, when they alight. On coming to the ground by day, they range themselves in a line, like cranes. When they have thus sat an hour or two, one of them, with a loud long note, sounds a kind of charge, to which the rest attend, and they pursue their journey with renewed alacrity. Their flight is very regular: they either go in a line a-breast, or in two lines, joining in an angle in the middle. It is thought their flight is thus arranged to cut the air with greater ease.

The Barnacle differs from both these; being less than either, with a black bill, much shorter than the preceding.

The

The Brent Goose is still less. The head, neck, and upper part of the breast black; about the middle of the neck, on each side, are two small spots or lines of white, which together appear like a ring.

These, and many other varieties, are found in this kind. The tame goose is the most prolific, having less to fear, leading a securer and more plentiful life: the wild goose seldom lays above eight eggs, the tame often above twenty. The female hatches with great assiduity; the gander visits her twice or thrice a day, and sometimes drives her off to take her place, where he sits with great state and composure. But beyond that of all animals is his pride when the young are excluded: he seems then to consider himself as a champion, not only obliged to defend his young, but also to keep off the suspicion of danger; he pursues dogs and men that never attempt to molest him; and, though the most harmless thing alive, is then the most petulant and provoking.

Of goose-feathers most of our beds in Europe are composed. Great numbers of geese are kept tame in the fens in Lincolnshire, and are plucked once or twice a year. The down of the swan is brought from Dantzic. The same place also sends us great quantities of the feathers of the cock and hen; but Greenland, Iceland, and Norway, furnish the best feathers of all; and in this number we may reckon the Eider down.

OF THE DUCK AND ITS VARIETIES.

THE tame Duck is the most easily reared of all our domestic animals. The instincts of the young direct them to their favourite element; and though conducted by a hen, they despise her clamorous admonitions. The duck seems to be an heedless, inattentive mother; she frequently leaves her eggs till they spoil; is equally regardless of her young; she leads them to the pond, and thinks she has sufficiently provided for her offspring when she has shewn them the water.

The wild duck differs, in many respects, from the tame; and in them there is still greater variety than among the domestic kinds. Of the tame duck there are not less than ten different sorts; and of the wild, Brisson reckons

reckons above twenty. The most obvious distinction between wild and tame ducks is in the colour of their feet; those of the tame duck being black, those of the wild duck yellow.

Sea-ducks, which feed in the salt-water, and dive much, have a broad bill, bending upwards, a large hind toe, and a long blunt tail. Pond-ducks, which feed in plasnes, have a straight and narrow bill, a small hind toe, and a short pointed train.

In this tribe, we may rank, as natives of our own European dominions, the ELDER DUCK, which is double the size of a common duck, with a black bill; the VELVET DUCK, not so large, with a yellow bill; the SCOTER, with a knob at the base of a yellow bill; the TUFTED DUCK, adorned with a thick crest; the SCAUP DUCK, less than the common duck, bill greyish blue; the GOLDEN EYE, a large white spot at the corners of the mouth, resembling an eye; the SHELDRAKE, the bill a bright red, swelling into a knob; the MALLARD, which is the stock from whence our tame breed has probably been produced; the PINTAIL, the two middle feathers of the tail three inches longer than the rest; the POCHARD, the head and neck bright bay; the WIDGEON, bill lead-coloured, plumage on the back marked with narrow black and white undulated lines, but best known by its whistling sound; the TEAL, the smallest of this kind, bill black, head and upper part of the neck bright bay.

The most noted foreigners of the tribe are, the Muscovy, or, more properly, the Musk Duck, so called from a supposed musky smell; with naked skin round the eyes; native of Africa. The BRASILIAN DUCK, the size of a goose, all black except the tips of the wings. The American Wood Duck, with a variety of beautiful colours, and a plume of feathers that falls from the back of the head like a friar's cowl. To these might be added many others.

All these live in the manner of our domestic ducks, keeping in flocks in the winter, and flying in pairs in summer, bringing up their young by the water-side, and leading them to their food as soon as out of the shell. Their nests are usually built among heath or rushes, not far from the water; and they lay twelve, fourteen, or more eggs before they sit. Their nests are sometimes on the tops of trees; generally composed of the longest grass, mixed with heath, and lined with the birds' own feathers. In proportion as the climate is colder, the nest is more artificially made, and more warmly lined with a layer of long grass and clay; within that another of
moss.

The Ostrich.

moths, and, lastly, a warm coat of feathers or down. The eider duck is particularly remarkable for the warmth of its nest. The inside lining, on which the eggs are deposited, is the softest, warmest, and lightest substance with which we are acquainted. This is the inside down which covers the breast of the bird in the breeding-season. This the female plucks off with her bill. The natives watch the place where she begins to build, and, suffering her to lay, take away both eggs and nest. Not discouraged by this disappointment, she builds and lays in the same place a second time; and this they also take away: the third time she builds, but the drake must supply the down from his breast to line the nest with; and, if this be robbed, they forsake the place, and breed there no more. They are in general birds of passage, and most probably perform their journeys across the ocean, as well on the water as in the air.

Ducks flying in the air are often lured down by the loud voice of the mallard below. Nature seems to have furnished this bird with very particular faculties for calling. The wind-pipe, where it begins to enter the lungs, opens into a kind of bony cavity, where the sound is reflected as in a musical instrument, and is heard a great way off. To this call all the stragglers resort. Though a timorous bird, yet they are easily deceived. Above thirty thousand have been sent up, in one season, from ten decoys in the neighbourhood of Wainfleet,

THE OSTRICH.

THE Ostrich is the largest of birds; some brought into England were seven feet high. The head and bill somewhat resemble those of a duck; and the neck that of a swan; but is much longer; the legs and thighs resemble those of an hen; from its size and appearance the Arabians call it the *Camel-bird*. From the back to the ground four feet; the head and neck three. From the top of the head to the rump, when the neck is stretched out, six feet; the tail about a foot; a wing, without the feathers, a foot and a half; with the feathers, three feet. The plumage generally black and white; some grey. The greatest feathers are at the extremities of the wings and tail, generally white. The next row is black and white; the small feathers, on the back and belly, are some white, others black; no feathers on the sides, on the thighs, nor under the wings. The lower part of the neck, about half way, is covered with still

smaller feathers than those on the belly and back; and of different colours. All these feathers are of the same kind, peculiar to the ostrich; as soft as down, utterly unfit for flying or defence. The feathers of other birds have the webs broader on one side than the other, but those of the ostrich have their shaft exactly in the middle. The upper part of the head and neck are covered with very fine clear white hair, that shines like the bristles of a hog; and in some places there are small tufts of it, consisting of about twelve hairs, which grow from a single shaft, about the thickness of a pin. At the end of each wing, there is a kind of spur almost like the quill of a porcupine; an inch long, hollow and horny. There are two of these on each wing; the largest at the extremity of the bone of the wing, the other a foot lower. The neck seems more slender by being void of feathers. The skin is of a livid flesh colour; the orifice of the ears bare, but a little hair within it. The bill is short and pointed, and two inches and an half at the beginning. In form, the eye is somewhat like the human, the upper eye-lid immovable, having eye-lashes; the tongue is small, very short; in some about an inch long, and very thick at the bottom. In others half an inch, and a little forked at the end. The thighs are very fleshy and large, covered with a white skin, inclining to redness, and wrinkled in the manner of a net, whose meshes will admit the end of a finger. Some have very small feathers here and there on the thighs; and others neither feathers nor wrinkles. The legs are covered in front with large scales; the foot has two very large toes, covered with scales. The largest, on the inside, is seven inches long, including the claw, which is near three-fourths of an inch in length, and almost as broad. The other toe, four inches long, has no claw.

The internal parts are no less surprisingly peculiar. On the breast, under the skin, the fat is two inches thick; on the fore-part of the belly, thicker, and as hard as suet in some places. It has two stomachs: The first, which is lowermost, somewhat resembles the crop in other birds; is considerably larger than the other, and furnished with strong muscular fibres, as well circular as longitudinal. The second stomach, or gizzard, is always filled with a variety of discordant substances; hay, grass, barley, beans, bones, stones. The kidneys are not, as in other birds, divided into lobes. The heart and lungs are separated by a midriff, as in quadrupeds; and other parts bear strong resemblance.

Native of the torrid regions of Africa, never known to breed out of that country, formed to live in sands and deserts, where few vegetables clothe the earth, and where rain is unknown. Here ostriches are

seen

seen in large flocks, which, to the distant spectator, appear like a regiment of cavalry.

The ostrich is, of all animals, the most voracious; devours any thing that is given; and digests all that is digestible; what the stomach cannot soften, passes whole. In their native deserts they live chiefly on vegetables, inoffensive and social, the male, as Thevenot assures us, assorting with the female with connubial fidelity. Lay very large eggs, some above five inches in diameter, and weighing five pounds, having a very hard shell. In the northern parts of Africa, about the beginning of July; in the south, about the latter end of December. Are very prolific; lay thirty to forty eggs at once. In those hot climates, there is no necessity for continual incubation; and the female frequently leaves her eggs by day, but broods over them by night; yet probably this varies with the temperature of the air; &c. In temperate climates the young are unable to walk for several days after they are hatched. During this time, the old ones are very assiduous in supplying and defending them; when brought forth, they are ash-coloured the first year, and covered with feathers all over.

Some savage nations of Africa hunt them for their flesh, or breed them tame to eat the young ones, hence called *Struthophagi*, or *Ostrich-eaters*. The eggs are said to be well-tasted, and extremely nourishing; and a single egg sufficient for eight men.

Of all known animals that use their legs in running, the ostrich is by far the swiftest: when pursued at a distance, he begins to run at first but gently; his wings, like two arms, working with a motion correspondent to that of his legs; his speed would very soon snatch him from the view of his pursuers; but, instead of going off in a direct line, he takes his course in circles; the hunters making a small course within, relieve each other, and keep him thus employed, two or three days together, till spent with fatigue and famine. Sometimes he defends himself with his beak, his wings, and his feet: Such is the force of his motion, that a man would be utterly unable to withstand him in the shock.

THE TOUYOU

IS chiefly found in Guiana, along the banks of the Oroonoko, in the inland provinces of Brasil and Chili, and the vast forests that border on the mouth of the river Plata; though not so large as the ostrich, is only

second to it in magnitude; by much the largest bird in the New Continent: at full growth six feet high; its legs are three feet long; its thigh is near as thick as that of a man. The toes differ from those of the ostrich, as there are three in the American bird, and but two in the former. Its neck is long, its head small, and bill flattened like the ostrich; but, in other respects, it more resembles a Cassowary. The form of the body appears round; the wings are short, and unfit for flying; has no tail, but is covered on the back and rump with long feathers, which fall backward, and cover the anus: these feathers are grey on the back, and white on the belly. It is very swift, and seems assisted in its motion by a kind of tubercle behind, like an heel, upon which, on plain ground, it treads very securely, but not on a descent; in its course it uses a very odd kind of action, lifting up one wing, which it keeps elevated for a time, till, letting it drop, it lifts up the other; whether as a sail to catch the wind, or as a rudder to turn its course, to avoid the arrows of the Indians, remains to be ascertained: however this be, the emu runs with such swiftness, that the fleetest dogs are thrown out in the pursuit. One of them, finding itself surrounded by the hunters, darted among the dogs with such fury, that they made way to avoid its rage; and it escaped, by its amazing velocity, in safety to the mountains.

When the young ones are hatched, they are familiar, and follow the first person they meet. I have been followed myself, says Wafer, by many of these young ostriches, which at first are extremely harmless and simple, but as they grow older, they become more cunning and distrustful; and run so swift, that a greyhound can scarcely overtake them. Their flesh, in general, is good to be eaten; especially when young. Their maintenance could not be expensive, if, as Narborough says, they live entirely upon grass.

The latest account we have of this bird is by Captain Tench, in his account of Botany Bay, which we shall give in his own words.

“The bird which principally claims attention is a species of ostrich, approaching nearer to the Emu of South America than any other we know of. One of them was shot, at a considerable distance, with a single ball, by a convict employed for that purpose by the governor; its weight, when complete, was seventy pounds, and its length from the end of the toe to the tip of the beak, seven feet two inches, though there was reason to believe it had not attained its full growth. On dissection many anatomical singularities were observed: the gall-bladder was remarkably large, the liver not bigger than that of a barn-door fowl, and after the
strictest

strictest search no gizzard could be found; the legs, which were of a vast length, were covered with thick, strong scales, plainly indicating the animal to be formed for living amidst deserts; and the foot differed from an ostrich's by forming a triangle, instead of being cloven." Goldsmith, whose account of the Emu is the only one I can refer to, says, 'that it is covered from the back and rump with long feathers, which fall backward, and cover the anus; these feathers are grey on the back, and white on the belly.' "The wings are so small as hardly to deserve that name, and are unfurnished with those beautiful ornaments which adorn the wings of the ostrich: all the feathers are extremely coarse, but the construction of them deserves notice; they grow in pairs from a single shaft, a singularity which the author I have quoted has omitted to remark. It may be presumed, that these birds are not very scarce, as several have been seen, some of them immensely large; but they are so wild, as to make shooting them a matter of great difficulty. Though incapable of flying, they run with such swiftness, that our fleetest greyhounds are left far behind in every attempt to catch them. The flesh was eaten, and tasted like beef."

This gentleman confounds the names Touyou and Emu, as others have before him; whereas the Emu is properly the Cassowary of Java.

THE CASSOWARY

WAS first brought into Europe by the Dutch, in 1597, from Java, in the East Indies, in which part of the world it is only found; the natives call it *Eme* or *Emu*. Next to the preceding, the largest and heaviest of the feathered species: the Cassowary, though not so large as the former, appears more bulky; its body being nearly equal, and its neck and legs much thicker and stronger in proportion.

It is five feet and an half long, from the point of the bill to the extremity of the claws. The legs are two feet and an half high, from the belly to the end of the claws. The head and neck together are a foot and an half; and the largest toe, including the claw, is five inches long. The claw alone of the least toe, is three inches and a half in length. The wing is so small, that it does not appear, being hid under the feathers of the back. All the feathers are of the same kind, and outwardly of the same colour. They are generally double, having two long shafts, which grow out of a short one, which is fixed in the skin. Those that are double are always of unequal lengths; some fourteen inches long, particularly on the rump; while

while others are not above three. The beards that adorn the stem or shaft are, from about half way to the end, very long, and as thick as an horse-hair, without being subdivided. The stem or shaft is flat, shining, black, and knotted below, and from each knot proceeds a beard; likewise, the beards at the end of the large feathers are perfectly black, and towards the root of a grey tawny colour; shorter, more soft, and throwing out fine fibres, like down; so that nothing appears except the ends, which are hard and black; because the other part, composed of down, is quite covered. There are feathers on the head and neck; but they are so short, and thinly sown, that the bird's skin appears naked, except toward the hinder part of the head, where they are a little longer. The wings, when deprived of their feathers, are but three inches long; their feathers are like those on the body. The ends of the wings have five or more prickles, of different lengths and thickness, which bend like a bow: hollow throughout, having only that slight substance within which all quills have. The longest of these prickles is eleven inches; a quarter of an inch in diameter at the root, being thicker there than towards the extremity; the point seems broken off.

The part most remarkable is the head; it is bare, and in a manner armed with an helmet of horny substance, that covers it from the root of the bill to near half the head backwards. This helmet is black before, and yellow behind. Its substance is very hard, being formed by the elevation of the bone of the skull; and it consists of several plates, one over another, like the horn of an ox. The eye is a bright yellow, and the globe, being above an inch and an half in diameter, gives it an air fierce and extraordinary. At the bottom of the upper eye-lid is a row of small hairs, over which is another row of black hair, which looks pretty much like an eye-brow. The lower eye-lid, which is the largest, is furnished also with plenty of black hair. The hole of the ear is large, open, and uncovered, surrounded with small black hairs. The sides of the head, about the eye and ear, having only a few hairs of covering, are blue, except the middle of the lower eye-lid, which is white. The part of the bill which answers to the upper jaw in other animals, is very hard at the edges above, and the extremity of it like that of a turkey-cock. The end of the lower mandible is slightly notched, and the whole is of a greyish brown, except a green spot on each side. As the beak admits a very wide opening, this contributes not a little to the bird's menacing appearance; the tongue an inch long. The neck is of a violet colour, inclining to that of slate; is red behind in several
laces,

places, but chiefly in the middle. About the middle of the neck before, at the rise of the large feathers, there are two processes, round at the bottom, formed by the skin, which resemble somewhat the gills of a cock, but are blue as well as red. The skin, which covers the fore-part of the breast, on which this bird leans and rests, is hard, callous, and bare. The thighs and legs are covered with feathers, and are extremely thick, strong, straight, and covered with scales of several shapes; but the legs are thicker a little above the foot than in any other place. The toes are likewise covered with scales, and are three in number: the claws are of a hard solid substance, black without, and white within.

The internal parts are equally remarkable. The cassowary unites, with the double stomach of animals that live upon vegetables, the short intestines of those that live upon flesh. The heart is very small, being but an inch and an half long, and an inch broad at the base.

It never attacks others; and instead of the bill, when attacked, it rather makes use of its legs, and kicks like an horse, or runs against its pursuer, beats him down, and treads him to the ground. The manner of going of this animal is not less extraordinary than its appearance. Instead of going directly forward, it seems to kick up behind with one leg, and then, making a bound onward with the other, it goes with such prodigious velocity, that the swiftest racer would be left far behind. Swallows every thing that comes within the capacity of its gullet. It is said, that the passage of the food is performed so speedily, that sometimes the eggs it has swallowed whole pass unbroken: the alimentary canal of this animal, as was observed above, is extremely short; and it may happen that many kinds of food are indigestible in its stomach, as wheat or currants are to man, when swallowed whole.

The cassowary's eggs are of a grey ash colour, inclining to green; not so large nor so round as those of the ostrich. They are marked with a number of little tubercles of a deep green, and the shell is not very thick. The largest of these is found to be fifteen inches round one way, and about twelve the other. The southern parts of the Indies seem to be the natural climate of the cassowary. His domain, if we may so call it, begins where that of the ostrich terminates. The latter has never been found beyond the Ganges; while the cassowary is never seen nearer than the islands of Banda, Sumatra, Java, the Molucca Islands, and the corresponding parts of the continent. Yet even there is rare.

THE DODO.

ITS body is massive, almost round, covered with grey feathers; just barely supported on two short thick legs like pillars, while its head and neck rise from it in a manner truly grotesque. The neck, thick and purfy, is joined to the head, which consists of two great chaps, that open far behind the eyes, which are large, black and prominent; so that the animal, when it gapes, seems to be all mouth. The bill is of an extraordinary length, not flat and broad, but thick, and of a bluish white, sharp at the end, and each chap crooked in opposite directions. They resemble two pointed spoons laid together by the backs. From all this results a stupid and voracious physiognomy; which is still more increased by a bordering of feathers round the root of the beak, and which gives the appearance of an hood or cowl, and finishes this picture of stupid deformity. Bulk, which in other animals implies strength, in this only indicates inactivity. The dodo seems weighed down by its own heaviness, and has scarce strength to urge itself forward. It is furnished with wings, covered with the soft ash-coloured feathers, but they are too short to assist it in flying. It is furnished with a tail, with a few small curled feathers; but this tail is disproportioned and displaced. Its legs are too short for running, and its body too fat to be strong.

This bird is native of the isle of France; and the Dutch, who first discovered it there, called it in their language the *nauseous bird*, as well from its disgusting figure, as from the bad taste of its flesh: however succeeding observers contradict this first report, and assert that its flesh is good and wholesome eating. It is a silly, simple bird, as may be very well supposed from its figure, and is very easily taken. Three or four dodos are enough to dine an hundred men.

Whether the dodo be the same bird with that which some travellers have described under the bird of the Isle of Nazareth, remains uncertain. The country is the same; their incapacity of flying is the same; the form of the wings and body is similar; the chief difference is in the colour of the feathers, which, in the female of the bird of Nazareth, are said to be extremely beautiful; and in the length of their legs, which in the dodo are short, in the other are described as long.

SURVEYS OF NATURE.

PART THE FIFTH.

OVIPAROUS QUADRUPEDES may justly claim a station after the superior orders of viviparous quadrupeds, and birds: endowed with less powers in certain respects, yet exhibiting much diversified contrivance, adaptation, and manners. Many persons have given the general name of REPTILE to this whole division; but that seems more properly applied to serpents, or such as use their belly to assist their motion.

This class of creatures have neither breasts, nor hair; but are clothed with a bony covering, hard or sharp scales, and tubercles more or less prominent, or with a naked skin, bedewed with a viscous liquid. They have short legs; and, instead of spreading their feet when walking, they fold them.

The most considerable are natives of the torrid zone; yet their blood is less endued with heat, than that of most other animals: they have also a less quantity of blood; it circulates slowly, and but little depends on the lungs. Many of them have no ribs; many have only four *vertebræ* in the neck, consequently little motion. Their heart has only one ventricle; their breathing is with intervals, and irregular, often suspended for a long time; they are fond of warmth and of humidity; and though inhabitants of various soils, rocky and dry, or sandy, or of the woods, yet all are amphibious; but cannot continue altogether deprived of air, or remain long under water, like fishes. In general survive considerable wounds, and even separation of some members, which, in certain cases, are reproduced. They are also extremely patient of hunger, and some live months without food: Their particles transpire but slowly, and consequently require only slow renovation. They never sweat. The major part of them are

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torpid,

torpid, when the atmosphere is cool, and sleep during winter; though often, if the season be mild, and the cold abated, they revive, and are found active and vigorous, even in winter. Extreme cold converts their torpidity into death. They lose scarce any of their weight during their torpid state; on their recovery, their external covering usually changes, and till their new attire is sufficiently hardened, they are greatly concealed, and solicitous of avoiding the risque of accidents. They are often found in troops; but their assembling is not the result of social, but of individual interest. They are in general very prolific, and often the largest kinds, especially, in which they contradict the rule adopted in respect to viviparous quadrupeds. Their eggs are never hatched by the parent; but, though not left open to accidents (being hidden, &c.) yet neglected; and consequently the posterity never knows its parent, nor experiences the tender cares necessary to avert or to soften the accidents of life. Most of them may be tamed, crocodiles not excepted. In general, they have more or less of a musky scent. They may be considered as usually very long-lived. Few of them are venomous.

The Tortoise.

The Turtle.

THE TORTOISE.

TORTOISES may be divided into those that live upon land, those of fresh waters, and those of the sea; the former being called Tortoises, the last Turtles, but all are amphibious; the land-tortoise will live in water, and water-tortoises on land; they are therefore rather named from the residence they prefer, than from being restricted to either.

Tortoises, in external form, pretty much resemble each other; their covering is composed of two great shells, a superior and inferior, only touching at the sides: the ribs, and the spine of the back, form part of the upper; the lower unites to the sternum. The lower is the least, the softest, and often almost flat. These shells are composed of several pieces, bound together at the edges by very strong and hard ligaments, with a small share of motion in some kinds. At each end of these united shells is an aperture, one for a small head, shoulders and fore-legs, to pass through; the other for the hind feet and the tail. These shells the animal never quits; but they serve for his defence, and are a very substantial and adequate defence. The upper shell has commonly thirteen or fifteen centre-pieces, and a border round them of twenty-two or twenty-five smaller. The under shell has, in some kinds, twelve or fourteen pieces, in others twenty-two or twenty-four. These coverings often weigh four hundred pounds in the marine kinds.

The tortoise has a small head, a little rounded at the muzzle, where are the nostrils; the mouth is beneath, opens to beyond the ears; the place of which is scarcely distinguishable; no teeth, but two bony serrated ridges in their place: these gather and grind its food. Such is the amazing strength of the jaws, it is impossible to open them where they once have fastened; even, when the head is cut off, the jaws still keep their hold; and the muscles, in death, preserve a tenacious rigidity. The legs, though short, are inconceivably strong; and it has been known to carry five men standing on its back with apparent ease.

The blood circulates in this animal, as in some cartilaginous fishes, by a very short passage through the circulation; and the lungs seem to lend only occasional assistance. From this conformation the animal can subsist some time without breathing.

The land-tortoise, from the use of its feet in walking, is much more nimble on land than the sea-turtle: if thrown on its back, by rocking
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and balancing its body, at last it turns itself on its face again ; which the turtle, when once turned, is unable to do. The nails on the toes of those long used to scratch for subsistence, or to burrow on land, are blunt and worn ; while those employed in swimming only, are sharp and long. The brain of the land-tortoise is but small ; yet three times as large as that of the turtle. They differ in the shape of their eggs, and in the passage by which they are excluded ; in the land-tortoise, the passage is so narrow, that the egg conforms to its shape ; and, though round when in the body, yet becomes oblong when excluded. This passage is wider in the turtle, and therefore its eggs are round. Turtles may readily be distinguished from tortoises, by their very long feet, often two feet long ; their toes unequal in length, and united by a membrane, being rather fins than feet. The tortoise hardly exceeds three feet long, by two feet broad ; some kinds not many inches ; the turtle is sometimes from five to seven feet long. Size, however, is a fallacious distinction ; since land tortoises, in some parts of India, grow to a very great magnitude, five or more feet long ; though probably not, as the ancients affirm, big enough for a single shell to serve for the covering of an house.

Most tortoises can put out, or withdraw at pleasure, their head, feet, and tail under the great penthouse of the shell ; there, secure from all attacks, defended on every side, it fatigues the patience, and defies the claws or beak of the most formidable animal of the forest. This the turtle cannot do so completely. As these creatures live wholly on vegetable food, they never seek encounters ; yet, if any of the smaller animals attempt to invade their repose, they are sure to suffer : for impreguably defended, furnished also with prodigious strength of jaw, wherever the tortoise fastens, it infallibly keeps its hold, till it has taken out the piece.

Is extremely tenacious of life ; the loss of a member is but a slight injury ; it will live long, though deprived of its brain, or its head. REDI cut off the head of a tortoise, and the animal lived twenty-three days after its separation from the body. The head also continued to rattle the jaws, like a pair of castanets, for above a quarter of an hour. Tortoises commonly exceed eighty years : there was one kept in the Archbishop of Canterbury's garden, at Lambeth, that was above an hundred and twenty. It was at last killed by the severity of a frost, from which it had not sufficiently defended itself in its winter retreat, which was a heap of sand at the bottom of the garden.

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The tortoise lives on vegetables sometimes, snails, or worms; is fond of fruits; and, when the forest affords them, is generally found not far from where they grow. As it moves but slowly, is not very delicate in the choice of food. Those kept in domesticity will eat any thing; leaves, fruits, corn, bran, or grass.

Tortoises are torpid like the bat, the serpent, the mole, and the lizard; and when food is no longer in plenty, happily become insensible to the want: is sometimes buried two or three feet in the ground, its hole furnished with moss, grass, and other substances, as well to keep the retreat warm, as to serve for food, in case it should prematurely awake. From this dormant state the tortoise is liberated by the genial return of spring; not much wasted by its long confinement.

The eggs of tortoises are furnished with a yolk and a white; but the shell is somewhat like those soft eggs that hens exclude before their time; yet much thicker and stronger. The tortoise lays but few; the turtle deposits from an hundred and fifty, to two hundred, in a season. When it prepares to lay, the female scratches a hole in the earth, generally in a warm situation, where the beams of the sun have their full effect; there depositing her eggs, and covering them with grass and leaves, she forsakes them, to be hatched by the heat of the season. The young are generally excluded in about twenty-six days; but this varies, as heat is more or less abundant. The little animals no sooner leave the egg, than they seek for provision; their shell, with which they are covered from the beginning, expands, and grows larger with age.

LAND TORTOISES.

THE most common is that called the GRECIAN: dwells in woods, and elevated lands. Is among the slowest of oviparous quadrupeds; resembles, in many respects, the fresh-water tortoises. Those on the mountains larger than those on the plains: about fourteen inches long, ten broad. A *nictitating membrane* to the eye; the under eye-lid only moveable; tail short; membraned feet; puts its feet very slowly to the ground, one toe (or rather nail) only at a time, till the whole

touch the ground. Thirteen scales compose the centre of the upper shell; the border has twenty-four, larger in proportion than usual among tortoises. The shell is greatly *globated* in form. Is more or less torpid, according to the season. Quit their retreats in spring, when the sexes seek each other. Lay in June four or five eggs, white, like those of the pigeon, in a hole; the heat of the sun hatches them in September. Never frequent the water. Is found in most temperate countries. Is good eating. In South-America dogs are trained to hunt tortoises, and to bay them till the hunters arrive.

That whose upper shell is very convex, and its scales also, each of its scales being in a manner *stellated* by yellow rays from its centre, where is a six-sided spot, yellow also, is a curious kind. There are several other kinds, of much the same manners. One has its upper shell, as it were, *shagreened* in the middle; some are reddish; some blackish; some have a protuberance on the head, vermilion colour and yellow. Of the small kinds the eagles take advantage, by carrying them great heights in the air; then letting them fall on the hard rocks, whereby their shells are broken, and the bird can feed on them.

FRESH-WATER TORTOISES

DIFFER from sea-turtles in having smaller feet; toes more apparent, but membraned; five before, four behind; a tail half as long as the body, and always extended when the creature is walking. Are found in most temperate countries in Europe, also in Asia, India, Japan, &c. Cannot support rigorous cold; sleeps even in temperate exposures; in a hole in the earth, which is often a month's work to make. Early in spring changes this dwelling for the water, where it is fond of sun-bath; in summer is mostly on land, where she lays, placing her eggs in a hole, covered with sand. The young scarcely exceed half an inch in length; at maturity, are eight or nine inches long; breadth three or four; they are long ere they reach this length. Feed on snails, and insects without wings: are very destructive of the smaller fry of fish, and even bite the larger, till, weakened with loss of blood, they become their prey. Often rejects the air-bladder of fish; where many of these are seen swimming, a tortoise may be suspected of having taken up his abode.

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There are several kinds; among them, one whose tail has a hooked kind of nail, resembling the sting of a scorpion, which has given him his name.

Among the most remarkable is the *soft-shelled* tortoise; much the largest of those inhabiting fresh water. Inhabits Carolina; the upper shell brown, the middle of it hard, strong, and bony; but the sides, especially the hind part, cartilaginous, soft, pliant like tanned leather, easily yielding to any form, yet thick and strong enough to protect the wearer: little risings scattered over the shell. The under shell is projected, in front, two or three inches before the upper, so that the animal might lay his head on it; soft and pliant here, but hard and bony behind. Head small; a *nictitating membrane* to the eye; the nostrils placed in a kind of projecting snout, soft, tender, and somewhat transparent. The feet strong and thick; five toes before; the three first strong, short, and having hooked nails: beyond the fifth, two false toes, serving to extend a large membrane, which unites them all. The same conformation in the hind feet, but only one false toe. This creature is strong, wild, and, when attacked, rises on its hind-feet, and throws itself furiously on its enemy, biting violently. Is good eating.

SEA TORTOISES, OR TURTLE.

OF all animals of the kind, the GREEN TURTLE is the most noted, and the most valuable. The delicacy, the salubrity, the nutritive qualities of its flesh, and its easy digestion, were long known to our seamen, and to the inhabitants of the coasts where they are native. And this aliment is the more acceptable, as being found beneath the burning zone. Dampier, that rough seaman, who has added more to natural history than half the philosophers before him, appears to be the first who informed us of their distinctions; and that the green turtle was chiefly prized for its flesh.

This animal is called green, from the colour of its shell, and in some the flesh. It is generally six or seven feet long, three or four broad, three or four thick in the middle, weighing two or three hundred weight; though some are from five to eight hundred, and others not above fifty. Do not acquire their entire dimensions under twenty years. Its upper shell is oval, surrounded by a border of separate pieces; the largest furthest from the head; roundish in part. The middle of the shell is com-

posed of fifteen pieces; of which some or other are often falling off by accidents of various kinds; the number and form of these vary. The under shell is shorter than the upper, and softer; composed commonly of twenty-three or twenty-four pieces. Its feet are very long; the toes united by a membrane, and much more used for swimming than for walking. In the hind feet, the first toe only has a sharp and visible nail: that of the second is less, and round; the three others very slight. In the front feet, the two interior toes have sharp nails, and the three others slight ones; the head, feet, and tail have small scales like a fish; the mouth opens behind the ears; has no teeth, but jaws very hard and strong; and instead of teeth, bony asperities: these are powerful enough to craunch shell-fish of any kind; which they eat frequently.

We are told by Laet, that on the Isle of Cuba they grow so large, that five men can stand on the back of one of them; and, what is more surprising, that the animal will go off with them upon its back, with a slow steady motion, towards the sea. They are found in great numbers on the Island of Ascension.

Its chief food is the alga, a submarine plant, that covers the bottom of several parts of the sea not far from the shore. There they are seen; when the weather is fair, feeding in great numbers, like flocks of sheep, several fathoms deep upon the verdant carpet below. At other times they go to the mouths of rivers, and they seem to find gratification in fresh-water and fresh air. When done feeding, they generally float with their heads above water, unless alarmed, when they suddenly plunge to the bottom. They often seek provision among the rocks, eating moss and sea-weed; and probably insects and small animals, as they are very fond of flesh when taken and fed for the table.

They couple in March; are during nine days almost incapable of separation. At breeding time, which varies on each side the line, they take sometimes a voyage of eight or nine hundred miles to deposit their eggs on some favourite shore. The coasts they always resort to are low, flat, and sandy; for being heavy animals, they cannot climb a bold shore; nor is any bed so proper as sand to lay their eggs on. Here the female is seen toward sun-set drawing near the shore, and looking earnestly about her. If she perceives danger, seeks another place: if not she lands at dark, and surveys the sand, where she designs to lay; then retires without laying; but the next night returns to deposit part of her burthen. She begins by working and digging in the sand with her fore-feet, till she has made sometimes several round holes, a foot broad, and two feet deep,
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just above high-water-mark. She lays ninety or an hundred eggs at a me, as big as an hen's egg, and round as a ball. The white of these eggs is said not to harden by heat, though the yolk does. She continues laying about an hour; during which time, nothing can disturb her. The eggs are covered with a tough white skin, like wetted parchment. When she has done laying, she covers the hole very lightly, but so dexterously that it is not an easy matter to discover it, and leaves her eggs to be hatched by the heat of the sun. At the end of fifteen days, in some places; in others, three weeks, she lays about the same number of eggs again; and again, at the end of another fifteen days, using the same precautions every time. In about twenty-four or twenty-five days, the young turtles, being about two or three inches long, burst from the sand, as if earth-born, and crawl directly to the sea, instinctively: but often, their strength being small, the surges beat them back on the shore; exposed a prey to thousands of birds, crocodiles, tigers, &c. that then haunt the coasts. Fishermen also seize as many young as they can, to breed up in inclosed places free to salt water. Of the whole brood scarce one in thirty lives to any size. When the turtles have done laying, they return to their accustomed places, weak, lean, and unfit to be eaten.

In these uninhabited islands, to which the green turtle chiefly resorts, the men that go to take them land about night-fall, and silently (for these animals, though without any external opening of the ear, hear very distinctly, there being an auditory conduit that opens into the mouth), lie close while they see the female turtle coming on shore. They let her proceed to her greatest distance from the sea; and, when she is busily employed in scratching a hole, they fall out and surprise her. Their manner is to turn her upon her back, which utterly incapacitates her from moving; and yet, as the creature is very strong, clasps the ground very fast, and struggles very hard, two men or more find it no easy matter; then they go to the next; and thus, in less than three hours, they have been known to turn forty or fifty turtles, each weighing an hundred and fifty, or two hundred pounds. There are several other ways of taking them; one is, to seize them when coupled together; another is striking them by the harpoon, when on the surface of the water; or at the bottom; another is, by diving, coming up beneath, and seizing it by the tail; the animal awaking, struggles to get free, and by this both are kept afloat till the boat arrives to take them in.

The **TRUNK TURTLE** is commonly larger than the rest, and its back higher and rounder. The flesh of this is rank, and not wholesome.

The **LOGGERHEAD** is so called from the size of its head, which is much bigger in proportion than that of the other kinds. The flesh of this is also very rank, oily, hard, and not eaten but in case of necessity. Yields an oil useful to preserve ships from worms; its hind feet, as well as its front feet, have two sharp nails among the toes; is bold, and even voracious; is said to seize young crocodiles by the tail, when in narrow passages, and bite it off. Eats fish, and cracks the largest shell-fish; fights hard when attacked.

The **HAWKSBILL** is the least, and has a long and small mouth. The flesh of this is often dangerous eating; but the shell supplies the tortoise-shell, of which such variety of beautiful trinkets are made. The shells of other turtles are porous; but this is firm, and, when polished, is beautifully marbled. They generally weigh three or four pounds; sometimes six or eight pounds. The shell consists commonly of thirteen leaves, or plates, placed like tiles on the roofs of houses, of which eight are flat, and five hollow; the border has twenty-five. They are raised and taken off by means of fire made under the shell, after the flesh is taken out. As soon as the heat affects the leaves, they start from the ribs, and are easily raised with the point of a knife. Being scraped and polished on both sides, they become beautifully transparent; or easily take any form, by making them soft and pliant in warm water, and then screwing them in a mould, like a medal: however, the shell is most beautiful before it undergoes this last operation.

Is found in Asia as well as America; lays its eggs rather in gravel than sand; when turned on its back, can recover its feet.

The **GREAT MEDITERRANEAN TURTLE**, which should rather be called the *leather-coated turtle* from its covering, is from five to eight feet long, and from six to nine hundred pounds weight; but is unfit for food, and sometimes poisonous. The shell, which is a tough strong integument, resembling an hide, is unfit for service. One of these, taken in 1729, at the mouth of the Loire, was of enormous strength, and by its struggles involved in the nets; it appeared at first terrible to the fishermen; but finding it impotent, they dragged it on shore, where it made a most horrible bellowing; and, when they began to kill it with their gaffs, was to be heard at half a mile's distance. They were still further intimidated by its nauseous and pestilential breath, which so powerfully affected them, that they were near fainting. This turtle wanted but four inches of eight feet

feet long, two feet broad: its shell resembles leather, and it is said it had teeth in each jaw, one rank behind another, like those of a shark; its feet also wanted claws; the tail was quite disengaged from the shell, fifteen inches long, more resembling that of a quadruped than a tortoise. Two or three have been taken on the coasts of Cornwall, in the year 1756, the largest of which weighed eight hundred pounds.

One, most probably of this kind, was caught about thirty years ago near Scarborough, and a good deal of company was invited to feast upon it; a gentleman, who was one of the guests, told the company that it was a Mediterranean turtle, and not wholesome; but a person who was willing to satisfy his appetite at the risque of his life, eat of it: he was seized with a violent vomiting and purging; but his constitution overpowered the malignity of the poison.

OF L I Z A R D S.

THIS tribe is the most numerous of those which form the order of oviparous quadrupeds, exceeding fifty species. They may easily be distinguished from others, by not having a shell as tortoises; yet having a tail, which frogs and toads have not: they are clothed with scales, more or less strong, or tubercles, more or less prominent. The forms and dimensions of their tail vary greatly; in some round, in others flat; in some extremely long, in others very short. With respect to size, no class has its ranks so opposite from the small Cameleon, an inch long, to the Alligator of the river Amazons, above twenty-seven feet. They are found of a hundred different hues, green, blue, red, chesnut, yellow, spotted, streaked, and marbled. The lizard would often please by its colours; but there is something in the animal's figure, counteracting the brilliancy of its scales, or the variety of its spots, giving an air of exquisite venom, or great malignity. The figure of these animals is not less various: sometimes swollen in the belly; sometimes at the throat; sometimes with a set of spines on the back; sometimes with teeth; sometimes without; some venomous, others harmless, or philanthropic: some are viviparous, some oviparous. Some bring forth small spawn, like fishes. The larger kinds bring forth eggs, which are hatched by the heat of the sun. The salamanders come forth alive, perfect and active; but those bred in water, and, as we suppose, from spawn, suffer

a very considerable change in their form. They are produced with an external skin or covering, that sometimes incloses their feet, and gives them a serpentine appearance: to this false skin fins are added, above and below the tail, that serve the animal for swimming; but when the false skin drops off, these drop also; and then the lizard, with its four feet, is completely formed, and forsakes the water.

They may be distinguished into the larger kind, or CROCODILES, &c. with flatted tails; the GUANOS, which have spines on their backs; the *green* or *common lizard* kind, whose tails are round, and their bellies scaly; then those which have scaly feet; those which have only three fingers; and those with wings; after which, those properly known by the name of *Salamanders*.

All have many points of similitude, in figure and colour; the whole tribe is easily distinguished, and strongly marked. All have four short legs; tails almost as thick as the body at the beginning, and generally tapering. All are amphibious; and formed internally like the tortoise, &c.

THE CROCODILE.

TRUE crocodiles have five fingers to their front feet, four to the hind foot, which is membraned, and nails only to the three interior toes of each foot. They have four glands, which furnish a strong musky smell.

To view this animal in all its terrors, of an enormous size, in surprising numbers, and committing unceasing devastations, we must explore the uninhabited regions of Africa and America, the banks of those immense rivers that roll through extensive wastes, the midst of marshy lakes, and drowned savannas, and among the banian trees of their sides; where arts have never penetrated, where force only makes distinction, and the most powerful exert their strength with most confidence and security. In the river Amazons, or the river Niger, they are found in hundreds, from eighteen to twenty-seven feet long, lying as close as a raft of timber upon one of our streams. They are here covered with mud; they indolently bask on the surface, undisturbed at the approach of an enemy, since, from repeated trials of their strength, they find none beyond their power to subdue.

Of

The Crocodile

Of this terrible animal there are three kinds; the Green Crocodile, Cayman, or Alligator; for in figure and nature these are the same: the Black Crocodile; and that of the Ganges.

This animal is sometimes found thirty feet long; its most usual length is eighteen or twenty. In one of this length, the tail exceeds five feet; the head and neck near three feet; the circumference five feet. The fore legs resemble the arms of a man, both within and without; have five fingers of a conical figure. The hinder legs, including the thigh and paw, two feet two inches; the paws, from the joint to the extremity of the longest claws, ten inches; of the four toes, three have large claws, the longest two inches; these toes are united by a membrane, like those of a duck, but much thicker. The head is long, at the top a little rising, the rest flat, especially towards the extremity of the jaws, covered by a skin adhering firmly to the skull and jaws. The skull is rough and unequal; about the middle of the forehead two bony crests, two inches high: the skull between these is proof against a musquet ball. The eye very small, and so placed in its orbit, that the outward part, when the lid is closed, is only an inch long, running parallel to the opening of the jaws: has a double lid, one within and one without: that within, like the nictitating membrane of birds, folds in the great corner of the eye, is transparent. The iris large in proportion to the eyes; yellowish grey; the eyes sparkling, and near each other, placed obliquely. Above the eye is the ear, not unlike in form to a brow. The nose is in the middle of the upper jaw, near its extremity, perfectly round and flat, two inches in diameter, of a black, soft, spongy substance, not unlike the nose of a dog. The jaws seem to shut one within another; the under jaw only moves, and only with a straight down motion; twenty-seven cutting teeth in the upper jaw, sometimes thirty-six; fifteen in the lower, sometimes thirty, with several void spaces between them: thick at the bottom, sharp at the point, of different sizes, except ten large hooked ones, six of which in the lower jaw, and four in the upper; the mouth fifteen inches long, nine in breadth, opens beyond the ears; could easily take in the body of a man. The body a dark brown on the upper part, a whitish citron below, with large spots of both colours on the sides. From the shoulders to the tail a covering of large scales, square, fifty-two in number; those near the tail not so thick as the rest. The creature has all over it a coat of armour; not every where proof against a musquet ball, especially under the belly. The gullet large. The tongue a thick, spongy, soft flesh, strongly connected to the lower

jaw by a membrane which covers it, and which is pierced in several places. Sixty-two joints in the back-bone, which, though very closely united, have sufficient play to enable the animal to bend like a bow to the right and the left.

The strength of every part of the crocodile is very great; the spine is jointed in the firmest manner; the muscles of the legs are vigorous and strong; its teeth are sharp, numerous, and formidable; its claws long and tenacious; but its principal instrument of destruction is the tail: with a single blow of this it has often overturned a canoe, and seized on the poor savage, its conductor.

Such is this formidable animal, the terror of the most navigable rivers, in some places lying hours, and days, stretched in the sun, motionless; so that one not used to them might mistake them for trunks of trees, covered with a rough and dry bark; but the mistake would soon be fatal, if not prevented; for the torpid animal, at the approach of any living thing, darts on it with instant swiftness, and drags it to the bottom. During inundations, they sometimes enter cottages, and seize the first animal they meet with. There have been examples of their taking a man out of a canoe, in the sight of his companions, without the possibility of assistance.

The crocodile seldom, except when pressed by hunger, or intent on depositing its eggs, leaves the water. Its usual method is to float on the surface, its nose above water, and seize whatever comes within its reach; if this method fails, it goes closer to the bank, and there waits, covered among the sedges, in expectation of some animal that comes to drink; it seizes the victim with a spring, and bounds very fast for so unwieldy an animal; then drags its prey into the water, and sinks with it to the bottom. If the creature the crocodile has surprised escapes, the tyrant pursues with all its force, and often seizes it a second time, especially if the road be straight and level. Often the crocodile seizes a creature as formidable as itself, and meets with a most desperate resistance. We are told of frequent combats between the crocodile and tigers; the instant they are seized, they turn with the greatest agility, and force their claws into the crocodile's eyes, while he plunges with his fierce antagonist into the river. There they continue to struggle for some time, till at last the tiger is drowned.

We are assured by Labat, that a negro, with no other weapon than a knife in his right hand, and his left arm wrapped round with a cow-hide, ventures boldly to attack this animal in its own element. As

soon

soon as he approaches the crocodile, he presents his left arm, which the animal swallows most greedily; but sticking in its throat, the negro has time to give it several stabs under the neck; the water also getting in at the mouth, which is held involuntarily open, the creature is soon bloated and expires. In Siam it is taken by throwing three or four strong nets across a river. When first taken, it employs the tail, which is the grand instrument of strength, with great force; but after many unsuccessful struggles, is at last exhausted; then the natives approach in boats, and pierce him in the tender parts till he is weakened with loss of blood; then they tie up his mouth, fasten his head to his tail, bending it like a bow, and tie his feet to the top of his back. Thus brought into subjection, or bred up young, is used to entertain the great men of the East; often managed like an horse; a curb is put into its mouth, and the rider directs it at pleasure.

In Egypt, and other countries, where the inhabitants are civilized, and the rivers frequented, this animal is solitary and fearful. Far from attacking a man, it sinks at his approach with precipitation. In some places, instead of being formidable, is not only inoffensive, but cherished. In the river San Domingo, the crocodiles are quiet and gentle; the children play with them, and ride about on their backs; sometimes even beat them without receiving injury. The inhabitants are very careful of this breed, and consider them as harmless domestics.

Crocodile's flesh is at best very bad, tough eating; but unless the muskbags be separated, it is insupportable. The negroes themselves cannot well digest the flesh: but a crocodile's egg is a most delicate morsel to them.

Breeds near fresh waters. To deposit her brood, the female always pitches on an extensive sandy shore, shelving to the water, for the greater convenience of access, and near the edge of the stream, that the young may have a shorter way to the water. The presence of a man, a beast, or a bird, deters her at that time; and she infallibly returns. If all is safe, she begins by scratching up the sand with her fore-paws, and making a hole pretty deep. There she deposits her eggs, of the size of a tennis-ball, covered with a tough white skin like parchment. Lays twice or thrice, at some days interval, from twenty to twenty-four eggs at each laying. Begins in April. She covers them close up in the sand, and they are vivified by the heat of the sun in about thirty days. The young crocodile is folded on itself in the egg; about six or seven inches long. They quickly avail themselves of their liberty; and run to

the water ; where the whole brood is scattered into different parts. By far the greatest number are destroyed, not only by voracious fishes, but by old crocodiles pressed with hunger ; the rest find safety in their agility or minuteness.

The eggs of this animal are eagerly sought by every beast and bird of prey ; including monkies, and several kinds of water-birds. The ichneumon was deified by the ancients for its success in destroying these eggs. At present the vulture, called Gallinazo, is their most prevailing enemy. Hiding in the thick branches of the trees, that shade the banks of the river, they watch the female in silence, and permit her to lay all her eggs without interruption. When she has retired, flocking all together on the hidden treasure, they tear up the eggs, and devour them in much less time than they were deposited.

Those between the tropics are lively the whole year ; those distant from them are more or less torpid in winter. The crocodile lives probably much above an hundred years, as it does not attain its full growth under thirty.

The *Black Crocodile* is found in the river of Senegal ; its snout is longer than the former ; its manners and ferocity yet more savage.

The crocodile of the Ganges resembles the first in colour ; its jaws are very long and narrow, its teeth more numerous ; its manners much the same.

THE WHIP-TAIL

IS so named, not from the resemblance of its tail to a whip in form, but in motion, vibrating very rapidly. This lizard inhabits the hot climates in America, particularly Peru : is often several feet in length ; his tail is somewhat dentelated on the sides, is flatted ; its feet membraned, like the crocodile, but he has five toes to each foot. One of the island of Ceylon drives off invaders, by beating them violently with his tail, which he shakes like a whip.

The Guano.

THE FORKED-TONGUED LIZARD

HAS often been mistaken for a young crocodile, or cayman, which he greatly resembles in general, from having a large throat, tubercles on the back, and a flatted tail; colour deep rusty yellow, mingled with greenish; but he has five toes to each foot, and they are not membraned, but very much separated from each other; each having also a nail, sharp and crooked. His tongue being divided, and extremely mobile, gives him a resemblance to serpents; in the rapid motions of his tail he resembles the whip-tail, by which name he has sometimes been called. Inhabits South-America. Is capable of climbing trees, by its toes being separated; is fond of water, but frequents the woods, and there preys. Its flesh good to eat; and its eggs sought after.

THE IGUANA.

THE Iguana may be known at once by a large protuberant skin beneath his throat, and by a range of elevated spines which runs down his back, and part of his throat, formed of very long and sharp scales, placed vertically; highest on the back, and gradually diminishing to the tail, which is round. The iguana is from five to seven feet long; the body about as thick as one's thigh: the skin of the body, tail, and feet is covered with small scales; those of the head extremely polished and lustrous. The eyes are large, seem but half opened, except when the animal is angry; then they appear large and sparkling; the opening for the ear is large: both jaws are full of very sharp teeth; the bite is dangerous, though not venomous, for it never lets loose till killed, or violently struck on the nose. The male has a skin hanging under his throat, which reaches down to his breast; when displeased, he puffs it up like a bladder; he is one-third larger and stronger than the female. The males are ash-coloured, or yellow, mingled with green, and the females are often a very beautiful green. The toes are separated; five to each foot; nails strong and hooked. In the front feet, the interior toe has but one joint, the

second two; the third three, the fourth four, the fifth two: the same in the hind foot; but the fifth toe has three.

The flesh, especially of the females, is the greatest delicacy of Africa, America, or India; the sportsmen of these sultry climates go out to hunt the iguana, as we do the pheasant or hare, in the beginning of the season, when the great floods of the tropical climates are past, and vegetation starts into universal verdure. This animal is the most harmless creature of all the forest, except when defending its female. About two months after the close of winter, the female quits the woods to lay her eggs on the sands of the sea-shore, always an odd one, from thirteen to twenty-five; the shell supple, like those of the turtle; the contents whitish, no glair; they are thought of exquisite relish. It lives on vegetables and insects among the trees, or sports in the water, without offering to offend: there, having fed upon the flowers of the *mabot*, and the leaves of the *mapou*, that grow along the banks of the stream, it reposes on the branches that hang over the water. Swims badly; its feet folded close to its body; its tail only moving, and driving it forward: But on land is swift. When in possession of a tree, seems conscious of security, and never offers to stir. There the sportsman finds it, and fastens his noose round its neck; if the head be placed so that the noose cannot readily be fastened, by hitting the animal a blow on the nose with a stick, it lifts the head, and offers it in some measure to the noose; or its attention is caught by whistling, and it lifts up its head; as it will, if tickled by the noose. May be domesticated; lives in the garden; is active during night; sees well in obscurity, and easily catches nocturnal insects. In walking he often darts out his tongue; he lives easy, and becomes familiar. Colours vary according to climate, age, and sex.

THE BASILISK

IS very far removed from that imaginary creature, whose sight was mortal, and whose substituary representations are made by awkward and extraordinary contortions of the Spiny Ray; a fish which is no monster, till made such by art. This lizard inhabits South America; has a very high
row

The Galeote.

row of crest-like scales down his back, in the form of rays, a little separated from each other; he has also a kind of hood on his head; he lives among trees, climbing easily; also by swelling his hood with air, and puffing up his whole dimensions, he becomes much lighter than before; leaps, and as it were flies from branch to branch; the same extension of his parts he uses when swimming. When reposed, tempering his natural vivacity, he seems pleased with being inspected; and gently agitates his crest, raising and falling it; which, by the different reflections of his scales, has a pretty effect. Often exceeds three feet long.

THE GALEOTE

HAS a crest from his head to the middle of his back, formed of scales, separate, large, thin, and pointed: his head is flat, very broad behind; eyes large; opening for the ears large; the throat a little swelled; feet long, and toes also, which are widely separated from each other. The tail is tapering, and three times as long as the body. Is but small. Some are azure on the back; whitish on the belly. Found in Asia, the Isle of Ceylon, Arabia, and Spain. Lives in the houses, on the roofs; feeds on spiders, and some say on young rats; and fights with small serpents, as do many other lizards.

THE GREY LIZARD

IS the gentlest, most innocent, and most useful of its kind; is the commonest also. Its motions are lively, and its course rapid. Is fond of the heat of the sun; is not afraid of man, nor shuns him, but looks at him: yet at the least noise is frightened, and disappears. Has five toes to each foot; his back is grey, with whitish spots, and has three long streaks, of almost black, running down it; his belly is greenish changing to blue; his throat has a kind of collar, of seven gold-coloured scales: belly is covered with scales, larger than those on the upper parts, forming cross

bands, five or six inches long. Does not bite when taken, but soon becomes familiar: was called by the ancients the Friend of Man. Its tail is very fragile; nearly twice as long as the body; spotted black and white; sometimes *re-shoots* a part mutilated. Feeds on insects, especially those which infest the garden or the field; to seize them, darts its tongue; which is large, forked, and has little asperities, scarce sensible, yet enough to hold its winged prey. Can live long without food; is torpid in cold weather. The female lays her eggs in the warmest exposure; they are round, scarce half an inch in diameter, are hatched by the warmth of the atmosphere. This lizard quits his skin, after his awaking from sleep; and also before he enters on his torpid state.

THE GREEN LIZARD

IS considered by LINNÆUS as a variety of the grey, but is much larger, and more shewy in its colours, which appear in perfection when it has acquired its new covering in spring. In the hot countries is sometimes thirty inches long; is of the same gentle manners as the former.

THE CAMELEON

IS a very extraordinary animal; is from eleven to fourteen inches long; delights to sit on trees, being afraid of serpents, from which it is unable to escape on the ground; is very gentle and inoffensive, but said to be always fearful or angry. This report is probably unfounded.

The head is flat at top; and on the sides: two risings originate from the nose, pass immediately over the eyes, and unite behind the head; where they meet a third coming from its summit, and two others coming from the chaps. The neck is short; the nostrils are at the end of the muzzle; the mouth is often so closely shut, that the separation of the lips is scarce discernible. No opening is found for the ears; its hearing therefore very imperfect; has no teeth, but bony ridges; the lips divide beyond the jaws; the tongue resembles an earth-worm, five or

The Camclion. ,

six inches long, ending in a kind of a thick knot, hollow, attached to a kind of spike, which enters into its cavity, and which it *sheaths*, when drawn on to it; it has a viscous liquid on it, which holds flies and other insects, on which the cameleon feeds; this he darts rapidly. Can live long (almost a year say some) without eating; he has no voice, but a kind of hiss when surprised. The eyes stand out of the head: they have a single eye-lid, shagreened like the rest, attached to the eye, and following its motion, through a crevice in which the sight of the eye appears, which is of a shining brown; and round it is a little circle of a gold colour; the animal often moves one eye, when the other is at rest; sometimes one will look directly forward, the other backward; one upward, the other downward. Has five very long toes on each foot; nails strong and hooked; the skin of the legs extends to the ends of the toes, and unites them together, yet so that they are divided into two parcels, one of three toes: the other two in the front foot the exterior parcel has the two toes; in the hind foot the interior has the two toes. He is not fond of water; but by this conformation of his feet he easily gripes small branches of trees; for his further security, his tail is prehensile, and serves as a fifth hand. When he changes place, and attempts to descend from an eminence, he moves with the utmost precaution, advancing one leg very deliberately before the other, still securing himself, by holding whatever he can grasp with his tail.

The head of a large cameleon is two inches long; from thence, to the beginning of the tail, four or five: the tail five inches, the feet two and a half: the body differs in thickness, at different times; sometimes, from the back to the belly, it is two inches, sometimes but one, for it can expand or contract itself at pleasure, not only throughout the back and belly, but also the legs and tail. The cameleon is often thus blown up for two hours together; then it becomes less and less, insensibly; for the dilatation is always more quick and visible than the contraction. In its contracted state, the animal appears extremely lean; the spine of the back seems sharp, and all the ribs may be counted; the tendons of the legs and arms may be seen very distinctly. This method of puffing itself up is similar to that in pigeons, whose crops are sometimes greatly distended with air. The cameleon has a power of driving the air it breathes from its lungs over every part of the body, tail and legs, between the skin and muscles; the muscles themselves are never swollen. The skin is very cold to the touch; and though the animal seems so lean, there

there is no feeling the beating of the heart. The skin is strewed with little risings, and has a grain not unlike shagreen, but very soft, because each eminence is as smooth as if it were polished. Some of these little protuberances are as large as a pin's head, on the arms, legs, belly, and tail; but on the shoulders and head they are of an oval figure, and a little larger; those under the throat are ranged in the form of a chaplet, from the lower lip to the breast. The colour of all these eminences, when theameleon is at rest in a shady place, is of a blueish grey, and the space between is of a pale red and yellow.

But when the animal is removed into the sun, the whole surface of the skin soon seems to imbibe the rays of light; and its simple colouring changes into a variety of beautiful hues. Wherever the light comes on the body it is of a tawny brown; but that part of the skin on which the sun does not shine changes into several brighter colours, pale yellow, or vivid crimson, which form spots of the size of half one's finger: some of these descend from the spine half way down the back; and others appear on the sides, arms and tail. When the sun is withdrawn, or in the shade, the original grey colour returns by degrees, and covers all the body. Sometimes the animal becomes all over spotted with brown spots of a greenish cast. When it is wrapped up in a white linen cloth for two or three minutes, the natural colour becomes much lighter; but not quite white, as some authors have pretended. The cause of these spots is by some thought to be fear, or heat, agitating its humours; for in the cold they are less vivid, and when dead very pale: others think the animal subject to a kind of jaundice, and these are effected by its bile.

Le Bruyn, during his stay at Smyrna, bought several, and kept four in a cage, permitting them at times to run about the house. The fresh sea-breeze seemed to give them most spirits and vivacity; they opened their mouths to take it in; he never perceived that they eat any thing, except now and then a fly, which they took half an hour to swallow; he observed their colour often to change, three or four times successively, without being able to find out any cause for such alterations; their common colour he found to be grey, or rather a pale mouse-colour; but its most frequent changes were into a beautiful green, spotted with yellow: sometimes the animal was marked over with dark brown; and this often changed into a lighter brown. Some colours, however, it never assumes; but mostly affects those necessary to its preservation; such as the
green

The Gecko.

green of trees, their bark, &c. where it lies concealed by its close similarity.

Lays nine to twelve eggs, oval and of supple shell. Inhabits all hot countries, Mexico, Africa, Ceylon, &c. On the banks of the Senegal, and the Gambia, is the object of veneration: the Negroes do not kill them; but when they are dead they eat them. There are some small variations (principally on the head) among them; but in general the race is pretty uniform.

THE WOOD SLAVER, OR SPUTATOR,

IS a lizard of two inches long, of which the tail is half; whitish under the belly, grey on the body: striped crosswise with deep brown; four bands of this deep colour cross the head and back; another smaller borders the upper jaw; six others form so many rings round the tail. There is no apparent opening for the ears: the tongue is broad, flat, and a little divided at the extremity: black spots on the summit of the head, and the muzzle; the feet are varied with grey, black, and white; five toes to each foot; scaly beneath, terminating in a kind of ball or scaly shell, without any sensible nail. Inhabits the hot countries of America, in houses, and carpenters' yards; hurts nobody, if not disturbed; but must be inspected with caution, as he is easily irritated. He runs along the walls, and if frightened he gets as near as he can to his enemy, and ejects against him a kind of black spittle, so venomous, that a drop of it swells the part on which it falls; the swelling is cured by camphorated spirit of wine or brandy, which is used in America against the sting of scorpions; this spittle may be seen gathering in the corners of the creature's mouth sometimes, when he is angry. Seldom quits his hole but by day.

THE GECKO

IS among the most extraordinary animals, by the general diffusion of its venom. In form, has a slight resemblance to theameleon; his head

almost triangular; is large in proportion to his body; his eyes large, tongue flat, covered with small scales, and the top indented; teeth sharp, and so strong, says BONTIUS, that they make impressions on the hardest substances, even steel. This animal is entirely covered with little warts, more or less rising; beneath the thighs is a row of tubercles, elevated and hollow: the feet are remarkable by oval scales, more or less indented in the middle, as large as the surface of the toes, regularly disposed one over another, like the slates upon houses: has nails to all its toes except the first. The tail longer than the body, covered with rows of scaly rings. General colour clear green, spotted with scarlet; his name imitates his cry, especially when rain is expected. Found in Egypt, India, Amboyna, the Molucca Isles. Hides in half rotten trees, and humid places; sometimes visits houses, where he spreads general consternation, and is quickly destroyed. BONTIUS asserts, his bite is so venomous, that unless the part wounded be cut off, or burnt, it is mortal in a few hours. The touch of his feet is very dangerous, and is said by some to poison provisions on which he walks. Some think this proceeds from his urine, which is very corrosive; others, that it is a sweat proceeding from the hollow tubercles beneath his thighs; his blood, and a kind of foam which starts from his mouth, when angry, are considered as mortal venoms, and furnish the inhabitants of Java a poison for their arrows. HASSELQUIST affirms, that the feet deposit a poison; that the creature is fond of substances impregnated with salt, and, by walking over them, leaves behind him a dangerous poison. He saw at Cairo three women nearly killed, by having eaten cheese lately salted, on which the Gecko, had deposited his poison. He saw also one of these lizards run over the hands of a man who endeavoured to take him: where he had trodden, was covered with little pustules, redness, heat, and some pain, like nettle-stings. It may be that this quality varies according to climate, season, &c. In the night this lizard croaks somewhat like a frog, which discovers his approach. After rain, he comes out of his retreat; walks slowly; eats ants and worms. The female lays oval eggs; covers them somewhat with earth, and the sun hatches them. Is supposed to be the *Tockaie* of Siam. Exceeds a foot in length.

There are one or two other lizards not unlike this in form; but whether in manners also, accounts have not determined.

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The Chalcide .

The Fluted . *Biped-Reptile* .

T H E S E P S .

THE Seps must be closely examined, to be distinguished from a serpent; as the opening for its ears is scarce discoverable, nor its legs. Eyes small. The Seps seems to make one in that particular group which separates the lizard from the serpent race. It has four legs, like the lizard, but very short, under an inch, sometimes scarce a quarter of an inch; and a long slender body, which it rolls round on itself, like the serpent. The fore legs are very near the head; the hind legs are placed far backward; the animal moves them briskly, and perhaps with advantage. They have three toes. These animals are found two or three feet long, with a large head and pointed snout. The whole body is covered with quadrangular scales; and the belly is white mixed with blue. It has four crooked teeth; also a very sharp pointed tail, which, however, inflicts no wound. On the back, two streaks of a lighter colour, bordered on each side with a thin blacker streak.

Inhabits Italy, France, &c. It is viviparous; fifteen young ones having been taken alive out of its belly. On the whole, it appears to bear a strong affinity to the viper; and some think its bite may be dangerous.

T H E C H A L C I D E

APPROACHES yet nearer to serpents in form than the Seps: longer in body; no opening for the ears; legs very short; its scales placed ring-wise on its body; each ring separated by a little gutter, as well on the body as the tail; the head resembles the Seps; three toes to each foot; inhabits hot countries; might have been thought the immediate link that unites the lizard to the serpent class, had not some *biped* reptiles been discovered, whose peculiar forms are yet more serpentine, from that circumstance.

T H E D R A G O N .

THE Dragon of imagination is a most terrible animal, but not that of nature; like what we have seen of the Basilisk, fancy has been equally remote from fact as from probability.

The Dragon or Flying Lizard lives on fruit-trees, and feeds on flies, ants, butterflies, and other small insects. Is a very harmless creature, and does no mischief in any respect. Its wings are composed of six cartilaginous rays, placed horizontally on each side the back, and near the fore legs; these bend backward, and sustain a membrane, which surrounds the first ray, and extends to the hind legs; each wing represents a triangle, its base attached to the back of the creature; this membrane, as also the body, is covered with scales, hardly perceptible, except under the wings; these wings resemble those of the flying fish, or those of flying squirrels. About the neck are three bags, which he can inflate at pleasure; his throat is wide; he has many and sharp teeth; on the back three rows of tubercles, ranging lengthways; legs long; five toes to each foot; long, separate, and having hooked nails; tail very thin; twice as long as the body, and scaly; whole length a foot. When he skims from one tree to another, he strikes the air audibly with his wings, and sometimes leaps thirty feet.

Inhabits Asia, Africa, and America; has an agreeable mixture of colours, black, brown, and blue, in spots or streaks, varying with climate, &c. He swims well; his wings and inflated wattles rendering him very buoyant.

T H E S A L A M A N D E R .

THE ancients have described a lizard bred from heat, living in flames, and feeding on fire. Marvellous imagination has here surpassed itself; or certain ill-observed circumstances have been magnified and multiplied, till, the bounds of truth being passed, no limits were set to roving suggestion.

The

The Dragon

The terrestrial Salamander is of the lizard kind. This name comprehends a large tribe. This lizard has been but imperfectly known, because he is rarely seen out of his hole: has four toes before, five behind; length seven inches or upwards. No scales on his skin, but a great number of little orifices, which discharge a viscous liquid that spreads over the skin, and *varnishes* the whole animal. The head is somewhat flat; the eyes on its upper part prominent, as also *interiorly* in the palate, where they are surrounded by a row of very small teeth, like those of the jaws. Colour deep; blueish on the belly; broad yellow spots on the body, feet, and eyelids. In the woods of Germany, some black above, yellow below. Has no ribs (like frogs). When touched, instantly bedews itself with the unctuous liquor mentioned, and can as rapidly become dry. This liquor is very acrid. Loves humid and cool spots, thick shades and woods, or hollow trees: passes winter, many together, in holes under ground. Walks very slowly on the ground; does not climb trees: is very retired; fears the heat of the sun, and quits its asylum only in rainy weather. Lives on flies, beetles, and other insects. Is often folded on itself like serpents; can remain some time in water, where it quits its skin; always endeavours to keep its nose above water. Has no apparent orifices for the ears; is silent. Defends itself only by its covering liquid, and seems insensible of danger. Is viviparous, brings forty to fifty young.

THE FLAT-TAILED SALAMANDER

IS capable of living on land as well as in water; but prefers the latter element for his residence. Has no sensible scales on his body, or nails on his toes; four toes before. Length six or seven inches. Head flat; tongue broad and short; skin hard, and sheds a kind of milk, when wounded: small whitish warts on the body. General colour more or less brown, lightening under the belly to a yellow. Is spotted, often round, deep-coloured brown in the male; sometimes blueish. The male has a kind of crest running down his back, membranous, and jagged: the tail has a membrane *vertically*, which makes the tail seem flat: the same nearly occurs in the female; but she has no crest on the back.

Loves

Loves gravelly water, where it hides under the stones, in ditches, and marshes, or ponds; rarely in running streams. In winter, retires commonly into subterranean humid places; walks very slowly on land; sometimes, when it comes to breathe at the water edge, has a little kind of whistle; is very tenacious of life; has been found in the midst of ice, sometimes frozen up, and recovered when the ice was thawed, which in ice-houses has been a long time after its congelation. Eats flies, water-insects, frog spawn, &c. also water-beans, which float on the ponds. Is not viviparous; but in April or May lays eggs, often twenty, which form two strings, and are united by viscous matter, which also envelopes them singly. When laid, they fall to the bottom of the water; as they enlarge, through the viscous jelly, and the transparent membrane which it incloses, is seen the young salamander folded in the liquor which this membrane contains. This embryo enlarges insensibly, and quickly moves with great agility: after eight or ten days he tears the membrane, and gains his liberty. In this state he has some conformity to fishes; while his legs are very short, he has on each side, and a little above his fore legs, little fringed tufts, which resemble fins, or a feather: they are analogous to the gills of fish, and perhaps serve for the same purpose, to filtrate the air contained in the water; these gradually diminish, and disappear, adhering to the skin.

In summer the aquatic Salamander quits his skin every four or five days; in more temperate weather after a longer interval. A day or two before this change, the animal is more listless than ordinary, nor regards worms or insects, his favourite prey. His skin is detached from his body in several places; and its colour fades: he uses his front feet to loosen and open his skin about his jaws, this he pushes over his head, till his fore legs are free; he continues to push this loosened skin off from him, as far as his fore-legs can reach; but he is obliged to rub against the stones, gravel, &c. to further his endeavours. After a while, the front part of the skin is turned on his back and tail; when seizing it with his mouth, and disengaging one hind foot after the other, he gets free from his late covering. Thus the old skin is turned inside outwards; but is not torn in any place: the space for the eyes is left void and open. After this operation, which engages an hour and a half, the animal appears in his full vigour, and his new skin is smooth and brilliant. The cast skin is found floating on ponds, &c. Even in winter, this animal often forms more than one new skin; for in temperate winters he is not torpid.

Sometimes

The three-fingered Salamander.

Sometimes the back part of this skin adheres too closely to yield to the creature's efforts; then it corrupts, and corrupts also the leg adjacent, which drops off; but this loss does not kill the animal. Salt is fatal to salamanders. Are not venomous. Inhabit most parts of the world.

THE THREE-FINGERED SALAMANDER

IS an instance, that, though imagination may have greatly augmented and disguised some observations and facts of Natural History, yet at the bottom may be truth; and could we strip off fallacy, or could we distinguish addition from fact, many relations, which are now ridiculous and false, might be admitted, under certain limitations. That the salamander is the creature of fire, is false; yet, the only one known of this species was found on the crater of Vesuvius, surrounded by the burning lava of that volcano. What further authority does poetic licence require to regard this lizard as incombustible?

This salamander has ribs; three toes before, four behind; head flat, rounded in front; tail thin, longer than the body. Colour deep brown, mingled with reddish on the head and belly. Nothing of its natural habits known, this being a solitary specimen: perhaps as many lizards, &c. are fond of the heat in the torrid zone, this might have strayed to where it was found, without suffering a heat greater than many others of its species elsewhere enjoyed.

OVIPAROUS QUADRUPEDS WITHOUT TAILS.

THE absence of the tail is in these a striking and permanent distinction; they are also but small in size, eight or ten inches being the largest. They have no scales on their body; their skin is full of warts, or tubercles, and bedewed with a viscid liquid. Most have only four toes before; some, instead of five behind, have six, more or

less marked; in some distinct, in others membraned. The hind legs much longer than the front; whence they do not walk, but leap: the *tarsus* almost always as long as the legs. They have no ribs, nor vertebræ in the neck, or at most one or two; their head being attached immediately to the body, like that of a fish. The young appear long under the tadpole form.

They may be divided into three kinds: 1. Those with long bodies and heads, thin bellies, and very long legs. 2. Those whose toes have a small viscus ball, by means of which they fix themselves even on the under surface of the most polished bodies. 3. Those with round bodies and heads, very short fore legs, hind legs not long; leap with difficulty; fear the light, and appear only in an evening; their eyes being formed similar to those of owls, &c.

T H E F R O G.

THE figure of the Frog is well known. Its power of taking large leaps is remarkably great. It is the best swimmer of all four-footed animals; Nature hath finely adapted its parts for those ends, the arms being light and active, the legs and thighs long, and furnished with very strong muscles: muzzle ends in a point; large eyes, lively, encircled with gold colour; ears behind the eyes, covered with a membrane: nostrils near the end of the muzzle: large mouth; no teeth; tubercles, and asperities on the back. Colour, more or less bordering on green, in some kinds. Four toes before; five behind, these membraned. The inner toe in all the feet separated from the others, and largest. A viscus humour sweats through the pores of its skin. Very little brain for its size; a very wide swallow; a stomach seemingly small, but capable of great distention. The heart has but one ventricle; so that the blood circulates without assistance from the lungs, while under water. The blood moves very slowly, and unequally, drop by drop. While young, they open and shut their mouth and eyes, every time the heart beats. The lungs resemble a number of small bladders joined together, like the cells of a honey-comb: are connected to the back by muscles, and can be distended or exhausted at the animal's pleasure.

The common Brown Frog couples early, generally about the middle of March. The male is usually greyish brown; the female inclining to yellow, speckled with brown. At this time their colours are nearly alike on the back; but as they change their skins almost every eighth day (the old one, after falling off, assuming the form of mucus), the male grows yellower, and the female browner. In the males the arms and legs are much the strongest; at this time they have on their thumbs a kind of fleshy excrescence, which they fix firmly to the breast of the female. Couple once a year: continue united days together. Their bellies greatly swollen; the female with eggs, the male with a limpid water. He throws his fore legs round her breast, and clasps his fingers between each other; the thumbs pressing with their thickest sides against her breast: nothing can induce him to let go his hold: the grasp seems involuntary and convulsive; they swim and creep together till the female has shed her eggs: these form a kind of cord, united by a glutinous matter which covers them: these the male impregnates as they are ejected.

A single female produces from six to eleven hundred eggs; in general by a single effort, though sometimes she is an hour in this task. While thus engaged, the male promotes their expulsion by working with his thumbs, and compressing her body closely. The eggs, when excluded, expand into a round form, and drop to the bottom of the water.

The egg, or little globe, black on one side, whitish on the other, which produces a tadpole, is surrounded with two different kinds of liquor, each inclosed in its proper membrane. That which immediately surrounds the globe is clear and transparent; that which surrounds the whole is muddy and mucous. The transparent liquor serves for nourishment to the tadpole from time to time, answering the same purposes as the white of the egg to birds. The tadpoles, when this membrane is broken, are found to adhere to it by their umbilical cord, which is attached to the head.

At the bottom of the water the white quickly and sensibly increases. After four hours the eggs begin to enlarge; and, growing lighter, mount to the surface of the water. After eight hours the white grows thicker, the eggs lose their blackness, and, as they increase in size, somewhat of their spherical form. After fifteen days the eyes appear (sometimes shut), and the lineaments of the hind legs. As the foetus increases in size, the skin lengthens: where the toes will be, is marked by little knobs; and

though no bone is yet formed, the shape of the foot is discoverable. The front legs remain hidden by the covering skin. The mouth of the tadpole is *under* the head; so that, like the shark, it must turn on its back to catch any thing above it: this motion they execute with almost imperceptible rapidity. The twenty-first day the egg opens a little on one side, and the tail peeps out, becoming more and more distinct every day. The thirty-ninth day the little animal begins its motion, moving at intervals its tail; and the liquor in which it is circumfused perceptibly serves it for nourishment. In two days more, some fall to the bottom; while others remain swimming in the fluid around them, increasing in vivacity and motion. Those at the bottom remain there the whole day; but having lengthened themselves a little (for hitherto they are doubled up) they mount at intervals to the mucus they had quitted, and are seen to feed upon it. The next day they acquire their tadpole form. In three days more they are perceived to have two little fringes, that serve as fins, beneath the head; and these in four days after assume a more perfect form. Now they feed greedily on the pond-weed; and, leaving their former food, continue to subsist on this till they arrive at maturity. When ninety-two days old, two small feet begin to burgeon near the tail; and the head appears separate from the body. The next day, the legs are considerably enlarged; four days after, they refuse all vegetable food; their mouth appears furnished with teeth, and their hinder legs are completely formed. In two days more the arms are completely produced; the skin divides on the back near the head, which passes through the division: the membrane, which served for a mouth to the tadpole, is drawn backward; the arms are projected; and the enveloping skin, perpetually driven backwards, at length quits the body: and now the frog is every way perfect, except that it still continues to carry a tail. In this odd situation the animal, resembling at once both a frog and a lizard, is seen frequently rising to the surface to breathe. Thus it continues about six or eight hours, till the tail diminishing by degrees, the animal appears in its most perfect form.

So extraordinary is this transformation, that the food it fed on greedily a few days before, is now rejected; it would even starve if supplied with no other: from having fed on vegetables, it becomes carnivorous, and lives entirely on worms and insects; quitting its native element, these it seeks on land. At first, being feeble, and unable to bear the warmth of the sun, it hides among bushes and under stones; but if a shower refresh the earth, then multitudes quit their retreats, to enjoy the grateful humidity:

midity : often the ground is seen perfectly blackened with their numbers, some seeking for prey, and some for secure lurking places. From the myriads that appear on such occasions, some have thought they were generated in the clouds, and showered down on the earth.

The Frog lives mostly out of water ; but, when the cold nights begin, returns to stagnant waters, where it can lie concealed at the bottom. Here it continues torpid, or with very little motion, all the winter ; but some reside in holes in the earth.

The difference of sexes is not perceivable in these animals till their fourth year, when they begin to propagate. It is said they live about twelve or fifteen years : but probably much more.

Frogs eat insects of all kinds ; also young snails, young mice, and ducklings ; but never, unless they have motion. They continue fixed and immovable till their prey appears ; when it comes sufficiently near, they jump up or forward, sometimes a foot or two, with great agility, dart out their tongues, and seize it with certainty. The tongue is extremely long (and this length of tongue is drawn out, like a sword from its scabbard, to assail its prey). It is furnished with a glutinous substance ; and whatever insect it touches infallibly adheres, till drawn into the mouth.

The Frog is very vivacious, and can bear hunger long. It will live and jump about several hours after losing its head ; will continue active, though embowelled : nor does the loss of its heart imply the loss of motion.

The croaking of frogs is well known ; and from thence, in some countries, they are distinguished by the ludicrous title of Dutch Nightingales. The large water frogs have a note like the bellowing of a bull, and puff up their cheeks to a surprising magnitude. The male only croaks ; the female rather growls. The male has a less disagreeable voice, as the call to courtship. When they couple, their croaking is in some places very troublesome, for the whole lake seems vocal, and a thousand dissonant notes perfectly stun the neighbourhood ; also, before wet weather, their voices, in full exertion, with unceasing assiduity welcome the approaches of their favourite moisture. Dry weather is hurtful to their health, and prevents them from getting their prey : they also want that grateful humidity which moistens their skin, and renders them alert and active.

CATESBY thinks that in Carolina the Frogs prefer those insects that shine in the dark ; whether as better pleasing their palate, or as being more

more readily discernible, is uncertain. Being out in the air one very hot evening, he chanced to let fall some burning tobacco from his pipe, which was instantly swallowed by a frog; as was a small burning coal of wood, and many other shining (though heated) bodies.

THE BULL FROG

IS very large; has large oval eyes, brilliant and prominent; iris red, bordered with yellow; upper part of his body deep brown, spotted deeper, with a tinge of yellowish green, particularly on the front of the head: belly dirty yellow, clouded with yellow, and lightly spotted. Commonly five toes to each foot, with a tubercle under each joint. Is less frequent than most other frogs; lives in springs, which are often on the sides of hills in Virginia; commonly two to each spring or pond. They sit at the entry of the hole which furnishes the water, and when surprised leap into the water. The Virginians think they purify the water, which perhaps they do, by destroying insects that might otherwise pollute it; but they also destroy young ducklings, if not goslings; which, having a very wide gullet, they can easily do. This conformation, and their size, aided by the echoes of the surrounding banks and cavities, renders their croaking somewhat formidable, and like that of a bull bellowing at a distance. A traveller, unused to them, is greatly at a loss to account for the noise they make, as they are themselves invisible, being entirely under water, except just their muzzles, whence issues their surprising croaking. Some have six toes on the hind feet.

THE TREE FROGS

FORM a peculiar species, distinguishable by a kind of small knob or button at the extremity of each toe. These knobs are unctuous, or viscid; and by this property the creature can easily support itself on the branches or leaves of trees.

Whatever

The Tree-frog.

Whatever has been said of the instinct or agility of frogs, applies with greater force to the *Green* or *Common Tree Frog*, which, in size, is less than the frog. Colour, on the upper parts, a beautiful green; beneath, where it has small tubercles, whitish. A yellow streak, slightly bordered with violet, extends on each side the head and back, from the nose to the hind feet; and another, answering it, from the upper jaw to the front feet. The head is short, as large as the body, but a little snubbed in front. The jaws are rounded; the eyes elevated. The body is short, almost triangular; very broad near the head, convex above, flat beneath. The front feet, which have but four toes, are short and thick; those behind have five toes; are very long and thin. The nails are flat and rounded.

The *Green Tree Frog* leaps with superior agility to the common Frog, because its hind legs are so much longer than the front. It passes all the fine weather in the midst of the woods, or branches of trees: its skin is so sticky, and its toes so adhesive, that it has but to place itself any where on a leaf, above or below, and it fears not falling. CATESBY says, they have the faculty of rendering their little knobs *concave*, which occasioning a vacuity, attaches them more strongly to the surface on which they fasten. He says also that they sometimes leap twelve feet. In fine weather they are seen darting on the insects that come within their reach; these they strike with their tongues like frogs, leaping from branch to branch. Like frogs, they continue long in their tadpole state; nor attain complete maturity till after three or four years, when they couple: till then they are nearly silent, even the males. They seek each other in the waters as frogs; and, in winter, hide in marshy places, but always those surrounded with trees, as if they still paid attention to what is their favourite residence. In April or May they are found in the lakes, and with sonorous croakings, perpetually repeated, and multiplied by every neighbour's note in addition, like a pack of hounds in full cry, they compose a most noisy chorus, which, in the silence of night, when rain is expected, may be heard at a league distance. The young are often two months before they attain their most perfect state; but, so soon as they are perfect, they forsake the waters for the woods. May be kept in houses without much trouble. Is found in Europe (the southern parts), in Africa, and America.

One American species is milk white, with faded spots.

That which our plate represents is the American kind, used by the Indians to colour the feathers of young parrots red or yellow. By

plucking the natural feathers of the parrot, and rubbing the place with the blood of this creature, the following feathers, instead of being green, as they otherwise would be, are red or yellow. Its colour is reddish.

T H E T O A D.

ITS colours vary with the season; sometimes inclining to red, then to black, or to olive. Why should the figure of the Toad disgust more than that of the Frog? Its form and proportions are not unlike; it chiefly differs in colour, being blacker, and by its slow and heavy motion, which exhibits nothing of the agility of the frog. Its body is rounded and broad; its back covered with a dusky, pimpled hide; its belly large and swagging; its pace laboured and crawling; its retreat gloomy and filthy; and by these ideas its appearance excites disgust. Its pimples are often greenish black. The auditory canal is closed by a membrane. Its front feet are short, and have four toes; those behind have six toes, united by a membrane. Its head is as large as its body, its jaws have no teeth; its eyes are swelled; its motion, when seized, is a *swelling*; it leaps badly; it ejects a liquor (thought to be its urine) when seized; and this, in some kinds and climates, has the repute of being venomous, or at least hurtful. The humour which sweats from its body, and its slaver, have the same character; but much seems to have been said beyond what our European Toads verify.

Lives in ditches, drains, dunghills, and caverns, in forests, and beneath great stones; here remaining all day hidden, unless a shower call it out. Prefers night to seek its prey. Is amphibious; lives on worms and insects, snails and beetles, which it seizes by darting out its length of tongue; crawls in moist weather; couple as frogs, early in spring, sometimes on land, but usually in the water; are united some hours. The obstetrical assistance which the male lends the female, is a peculiarity in this species. In a summer's evening, a French gentleman perceived, in the king's gardens at Paris, two toads coupled. Two facts equally new surprised him: the first was the extreme difficulty the female had in laying her eggs; the second was the assistance lent her by the male for this purpose. The eggs of the female lie in her body, like beads on a string; after the first, by great effort, was excluded, the male caught it with his hinder

hinder paws, and kept working it till he had extracted the whole chain, which is often forty feet long, impregnating every egg as it issued from the body. It is probable this difficulty occurs only on land. The number of males is found to surpass that of the other sex thirty to one.

The account given of the progress of the frog in and after its tadpole state, is descriptive of the same events in the life of a toad, and need not be repeated. When they have undergone all the variations of that state, they forsake the water, and are often seen, in a moist summer's evening, crawling up, by myriads, from fenny places into drier situations. There, having found out a retreat, or having dug themselves one with their mouth and hands, they lead a patient, solitary life, seldom venturing out, except when the moisture of a summer's evening invites them abroad. We have the authority of Linnæus for saying, that they sometimes continue immoveable, with the mouth open, at the bottom of shrubs, where butterflies, in some measure fascinated, are seen to fly down their throats.

In a letter from Mr. Arscott are some curious particulars relating to this animal. "I knew it myself above thirty-six years; and by constantly feeding it, brought it to be so tame, that it always came to the candle and looked up, as if expecting to be taken up and brought upon the table, where I always fed it with insects of all sorts. It was fondest of flesh maggots, which I kept in bran; it would follow them, and when within a proper distance, would fix his eyes, and remain motionless for near a quarter of a minute, as if preparing for the stroke, which was an instantaneous throwing its tongue at a great distance upon the insect, which stuck to the tip by a glutinous matter. The motion is quicker than the eye can follow. I cannot say how long my father had been acquainted with the toad before I knew it; but when I was first acquainted with it, he used to mention it as the old toad I have known so many years. This old toad made its appearance as soon as the warm weather came. Spiders, millepedes, and flesh maggots, seem to be this animal's favourite food. In the heat of the day they will come to the mouth of their hole, I believe for air. I once, from my parlour window, observed a large toad I had in the bank of a bowling-green, about twelve at noon, a very hot day, very busy and active upon the grass. So uncommon an appearance made me go out to see what it was; when I found an innumerable swarm of winged ants had dropped round his hole; which temptation was as irresistible as a turtle would be to a luxurious alderman. A tame raven one day seeing it at the mouth of its hole, pulled it out, and, although I rescued it, pulled out one eye, and hurt it so, that notwithstanding its living a

twelvemonth, it never enjoyed itself, and had a difficulty of taking its food, missing the mark for want of its eye."

The Toad is torpid in winter ; often many in the same hole ; and retreats to the hollow root of a tree, the cleft of a rock, or the bottom of a pond, where it is in a state of seeming insensibility. As it is very long-lived, it is very difficult to be killed ; its skin is tough, and cannot be easily pierced ; and, though covered with wounds, the animal continues to shew signs of life. But what shall we say to its living lodged in the bosom of stone, or cased within the body of an oak ? BACON asserts that Toads have been so found : Dr. PLOTT asserts the same. There is to this day a marble chimney-piece at Chatworth, with the print of the toad upon it, and a tradition of the manner in which it was found. In the Memoirs of the Academy of Sciences there is an account of a toad found alive and healthy in the heart of a very thick elm. In the year 1731 there was another found near Nantz, in the heart of an old oak without the smallest issue to its cell, and the discoverer was of opinion, from the size of the tree, that the animal could not have been confined there less than eighty or a hundred years. To these we can only oppose the strangeness of the facts ; the necessity this animal appears under of receiving air ; and its dying like all others in the air-pump, when deprived of this all-sustaining fluid. Certain it is that, if kept in a damp place, the toad will live for eighteen months without any food whatsoever ; and though kept in boxes sealed carefully with wax. It is probable that those in trees were not absolutely without air ; since some might be transmitted by the pores or air vessels of the wood. That some, thus found, were rather preserved from putrefaction, than really living, seems also supposable ; and if so, there being no evaporation through stone, they might have retained their moisture many centuries, and yet have furnished somewhat thought to be blood.

Of this animal there are several varieties ; such as the Water and the Land Toad, which probably differ only in the ground colour of their skin. In the first, it is more inclining to ash-colour, with brown spots ; in the other, the colour is brown, approaching to black. The water toad is not so large as the other ; but both equally breed in that element. The size of the toad with us is generally from two to four inches long ; but, in the fenny countries of Europe, much larger. But this is nothing to their size in some of the tropical climates, where travellers often, at the first time, mistake a toad for a tortoise. Their usual size is from six to seven inches, and some larger. In Carthage and Porto-bello their bite

bite is said to be very dangerous. All these are found in the tropical climates in great abundance, and particularly after a shower of rain; then the streets, courts, and gardens seem entirely covered with them; they then crawl from their retreats, and go into all places to enjoy their favourite moisture. With us, the opinion of its raining toads and frogs is justly exploded; is still entertained in the tropical countries, and that not by the natives only.

The BROWN TOAD is smooth-skinned, having no warts, but large brown spots which touch each other; largest on the back. The crevice for the eyes, when contracted, is vertical, instead of horizontal. Is found in marshes: when enraged, exhales a foetid smell, somewhat like gunpowder, strong enough to cause weeping. Some have thought it mortally-venomous; this is too much; but that it may be hurtful seems likely.

The CALAMITE has two false nails on the soles of his feet, which, with a horny substance at the extremity of his toes, enable him to clamber up walls, &c. several feet.

The FIRE-COLOURED TOAD carries his agility yet farther; can bear day-light, and his eye then takes a triangular form, whose outline is golden. Croaks without swelling his throat. Seems to form a link between the frog and the toad kinds.

The PIPAL or SURINAM TOAD. The male and female are so different, that they may easily be mistaken for two distinct species. The male has four toes, separate, on the front feet; and five, membraned, on the hind feet. Each toe on the front foot is divided into four small parts at its extremity. The head is scarce distinguishable from the body; the opening of the gullet very large; the eyes very small, and distant from each other, placed on the upper part of the head; head and body very flat. General colour olive, more or less clear, and sprinkled with very minute specks, red or reddish.

The female is much larger than the male; her head is triangular; at its base much larger than the anterior part of the body. The body is commonly full throughout of very small warts; is five or six inches long; in other respects agrees with the male.

It was once thought that the eggs, when formed in the ovary, were sent, by some internal canals, to lie and come to maturity under the bony substance of the back, and, in this state, were impregnated by the male, the skin continuing still apparently entire, forming a very thick covering over the whole brood; but the fact is, that after the eggs are
impregnated

impregnated in the usual way, the male gathers them up, and places them on the back of the female, where they adhere : the skin of her back swells and forms around them little cells, where they are hatched. At first, they have a tail like tadpoles, which soon quits them.

The HORNED TOAD is frightful ; his head half the size of his body ; his jaws open enormously ; his eye-lids have the form of a pointed cone, which makes them seem armed with horns, wherein are his eyes. His feet have something the air of hands.

B I P E D R E P T I L E S.

WE have seen that the Seps and the Chalcide approach very nearly in form to the order of Serpents, by their length of body, and by their extreme shortness of feet. The present class of reptiles is yet more serpentiform, and unites more closely the Lizard kind to the Serpent. They follow, with propriety, the Oviparous Quadrupeds, as in many respects allied, yet differing, by having two feet only ; and they precede the Serpents, as feet are entirely wanting to those creatures : in other respects they might easily be confounded with them, by their length of body, proportion of the head, and form of the scales.

On this class of creatures little has hitherto been determinate and authentic : that many imperfect quadrupeds of the seps, &c. kinds, have been supposed bipeds is certain ; on the other hand, the immature state of some salamanders, and others, resembles that of the several supposed bipeds ; but whether there be any creature which in its *larva* state equals thirty-one inches in size, as some of these have been found, remains in obscurity.

T H E F L U T E D

WAS found in Mexico by M. VELASQUEZ ; has no hind feet ; is clothed with scales, disposed in rings ; has a very short tail. Its scales are almost square, ranged in half rings on the back, and also on the belly, corresponding to each other where they meet ; and here is a kind of fluting, or groove, running down the animal on each side. The tail has its scaly rings entirely round. Total length of this individual nine inches. The head of this creature is rounded ; the upper part covered
with

with one great scale; the muzzle has three scales; the two exterior perforated, for the nostrils. Teeth very minute; eyes scarce visible; no eye-lids. The feet covered with little scales in rings; four toes to each foot, with nails long and hooked. This remarkable creature's manners are unknown: probably they resemble those of the Seps, and the Chalcide.

THE SHELTOPUSICK

WAS first discovered by Dr. PALLAS: is found near the Volga, in the sandy deserts of Naryn, and near the Cuman. Prefers long grass, and shady vegetation: hides among shrubs, and flies when approached. Preys on small lizards. His head thicker than his body; snout rounded; small teeth; large nostrils: two moveable eye-lids; and openings for the ears, like lizards. On each side the body a kind of groove; at the ends of these grooves, near the vent, two very small feet, covered with four scales, dividing into two kinds of toes, sharpish. The tail much longer than the body. Total length exceeding three feet. Colour nearly uniform, pale yellow.

OF SERPENTS.

THERE is scarce a country in the world that does not maintain some of this poisonous brood; for though mankind have driven off the lion, the tiger, and the wolf, the snake and the viper defy their power; and frequently punish their temerity. In Europe, however, not only their numbers are thinned, but their powers are diminished: if we have not extirpated them, we have prevented their multiplication; and the temperature of our climate refuses to furnish the qualities necessary highly to exalt their venom. The malignity ascribed to European serpents of old, is now unknown. A burning pain in the part, removeable by timely applications, is the worst effect now generally experienced from their bite. In the ardent countries of the tropic, those regions of both hemispheres where the fields are unpeopled and fertile, where the climate supplies warmth and humidity, where the sun is hot, the forests thick, and men few, there serpents cling among the branches of the trees in infinite numbers, encompassing them like a wreath, and rising and descending at pleasure. Many are common to both continents: especially the largest kinds. In those burning countries, what had the appearance of a great river in the rainy season, becomes in summer one dreary bed of sand; here a lake that is constant, or a brook that is perennial, is to all animals the greatest enjoyment; parched by the heat, they traverse whole deserts to find out water, nor can danger deter them from attempting to slake their thirst. On its banks thousands of animals attend to drink or to prey. The lion and tiger, but chiefly the larger serpents, are upon the watch. Not an hour passes without some dreadful combat; but the serpent, defended by its scales, and naturally capable of sustaining a multitude of wounds, and even of renovating its tail, is of all others the most formidable; it is the most alert, especially before a storm; it is the most wakeful also; for the whole tribe sleep with their eyes open.

It is probable, in early times, that serpents, continuing undisturbed possessors of the forest, grew to amazing magnitudes; and might reign the tyrants of a district for centuries. Time and rapacity might lengthen them to an hundred or an hundred and fifty feet. It is possible too they might sometimes venture from their retreats, and carry consternation among mankind, as they had before spread desolation among the lower ranks

banks of nature. We are told that, while Regulus led his army along the banks of the river Bagrada in Africa, an enormous serpent disputed his passage over. We are assured by Pliny, who says that he himself saw the skin, that it was an hundred and twenty feet long, and that it had destroyed many of the army. At last, however, the battering engines were brought out against it, and by these it was soon destroyed. Its spoils were carried to Rome, and the general was decreed an ovation for his success. The skin was kept several years in the Capitol.

Serpents even now are the longest of animals, exceeding even crocodiles, and yielding only to whales, &c. They are also the smallest, many being but two or three inches long, and the size of a quill. Those of the large kinds are rare, and distant from each other; those of the middle sizes often are heaped on each other in subterranean retreats.

Serpents, in general, are evidently distinguished from the rest of animated nature. They have the length and the suppleness of the eel, but no fins; they have the scaly covering and pointed tail of the lizard, but no legs; they have the crawling motion of the worm, but also lungs to breathe with: upon the whole, their external shape is the simplest among animals possessing blood.

The colours of serpents are extremely various and brilliant, especially in sun-shine; from the most lively white and red, to the deepest black. Some shew one shade only; others exhibit many colours—contrasted, interwoven in meshes, distributed in lines, prolonged in streaks, disposed in bands, spread in spots, or scattered in stars; sometimes in regular forms, sometimes in irregular: an infinite dissimilarity.

Their head is generally protected throughout by a bony helmet: but the back of the skull is rather short, by which formation the origin of the spinal marrow is exposed; and here they are easily and mortally vulnerable. All serpents have very wide mouths in proportion to the size of the head, and can swallow the head of another animal three times as big as their own. Their jaws do not open as ours, one way only, but are held together at the roots by a stretching muscular skin; by which they open widely, like stretching leather, extending to admit the morsel, which the stomach receives in part, while the rest remains in the gullet till dissolved; often part remains in the mouth, and fills it, their windpipe being placed so as to suffer no injury.

Their hearing is probably dull: the sonorous rays passing through a covering of scales to the auditory processes. Their smell is also thought to be feeble; as their nostrils are but small, and surrounded with scales.

The eyes of serpents are small, compared to their length of body ; differently coloured in different kinds ; yet in all malign, brilliant, and lively ; very mobile and projecting, and so placed as to receive images from the greatest space their position admits. Their sight, therefore, may justly be esteemed sharp and piercing. In some, the upper eye-lid is wanting, and the serpent winks only with that below ; in others, the animal has a nictitating membrane, resembling that of birds, which keeps the eye clean, and preserves the sight. The substance of the eye in all is hard and horny ; the crystalline humour, occupying great part of the globe.

The tongue is thin, long, and forky ; composed of two long fleshy substances, which terminate in points, and are very pliable. At the root it is connected very strongly to the neck by two tendons, that give it a variety of play. Some of the viper kind have tongues a fifth part of the length of their bodies, which are continually darting out ; but their poison is not in these.

The gullet is wide, capable of being distended greatly ; at the bottom of this lies the stomach, which is not equally capacious.

Serpents are furnished with very large lungs, in some extending three quarters of their bodies : these they fill with air at once, but let it slowly escape.

The heart, as in the tortoise, frog, and lizard, has but one ventricle ; and the communication between the blood which comes to, and that which quits the heart, is independent of the lungs and of breathing. Hence they are amphibious ; but though all are amphibious, some love the water more than others ; and probably the largest kinds. Their blood flows extremely slowly, possesses little warmth ; and hence they are in certain degrees of temperature torpid. These are the lesser kinds ; the larger inhabiting climates where no such temperature is known. They awake early in spring, and, what is remarkable (as of all sleeping animals), when the air is not equally warm as when they forsook it in autumn.

The vent in these animals serves for the emission of the urine and the fæces, and they contain the necessary parts for perpetuating the species. These are double ; but there are no external marks whereby to distinguish the sexes.

The body of serpents is long, slender, and capable of bending in all directions, and even folds several times on itself : the joints in the backbone are numerous ; in some amounting to an hundred and forty-five from the head to the vent, and twenty-five more from that to the tail.

These bones play one within another, like ball and socket, so that they have complete motion upon each other in every direction. From the head to the vent are two ribs to every joint, usually longest in the middle of the body, and capable of motion in various directions: towards the end of the tail these ribs cease. They are furnished with muscles, four in number, which being inserted into the head, run along to the end of the tail. The vertebræ and ribs compose the whole solid parts of serpents; so that their internal parts are defended below only by the scales on which they move, and by a kind of fatty matter, which lines the skin of their belly, often in considerable quantities. This fat also contributes to their warmth.

Some time after the animal awakes in spring, he acquires a new skin, and hides till it be hardened.

Almost all their scales, but particularly those under the belly, which contribute to motion, are moveable, independent of each other, by a muscle which belongs to each. As the edge of the foremost lies over the end of the following, when the scale is erected, it catches in the ground, and furnishes a point of resistance to promote the animal's progressive motion. It is evident that these scales, lying all one way, impede, or at least do not assist, motion the other way; and very few serpents move equally well backward as forward, though some do. In some of the serpent kind there is the exactest symmetry in these scales; in others they are disposed more irregularly. In some there are larger scales on the belly, and often answering to the number of ribs; in others, the animal is without them. But serpents have another more powerful principle of motion, by bending into an arch more or less of their body; the two extremes of this arch being drawn together, one of them serves for a point of resistance to the other, when the arch is straightened. At each repetition of this action, they may be said to make a leap of such a distance; and this is proportionate to the size, &c. of the creature. During this motion they carry their heads as high as they can. In comparing this to vermicular motion, we observe, that the earth-worm has no backbone; but its body is composed of rings, which it can lengthen or shorten as necessary: therefore, to move forward, it lengthens the body, and by the fore part clings to the point it has reached; then contracts, and brings up its rear; then, the body being shortened, the fore part is lengthened again for another progression, and so on: while the serpent, instead of shortening the body, bends it into an arch; and this is the principal difference between serpentine and vermicular progression.

When

When certain serpents propose to dart suddenly on their prey, they roll themselves into a spiral, raising only their head; and springing at once, uniting the elasticity of each part into one whole, they bound with the rapidity of a dart. The motions of serpents, when climbing trees, proceeds on the same principles as on the ground; but sometimes they hang by the tail, and swinging themselves backward and forward, at length reach the bough they aspire to. There are many serpents that dart with such amazing swiftness, they appear rather to leap than crawl; and we are told by some that they will dart to a very great distance. The manner of progression in the swiftest serpent we know (the *Jaculus*), is by instantly coiling itself upon its tail, and darting from thence to its full extent; then carrying the tail as quick as lightning to the head, coiling and darting again; and by this means proceeding, with extreme rapidity, without ever quitting the ground. CARLI describes the Long Serpent of Congo, making its track through the tall grass, like mowers in a summer's day. He could not without terror behold whole lines of grass lying levelled under the sweep of its tail. In this manner it moved forward with great rapidity, till it found a proper situation frequented by its prey.

Among serpents some are silent; but hissing is their common sound, either as a call to their kind, or as a threat to their enemies. In the countries where they abound, they are generally silent in the middle of the day, when they are obliged to retire from the heat of the climate; but as evening approaches, they are then heard issuing from their cells, with continued hissings. Their hissing is generally the prelude to their combats; never is the language of pleasure or of love, but always speaks anger and fury, or pain and vexation; is never heard from far, as it would betray their retreats or approaches. The serpent preys indiscriminately; the buffalo, the tiger, the gazelle, the stag, the porcupine, birds also, of which it generally ejects the feathers; nay, they frequently are seen to devour each other; yet they are capable of protracted hunger, and suffer little by it. Vipers are often kept in boxes six or eight months without food: and some assert, certain serpents may be kept years. In a letter by ANDREW CLEYERUS, printed in the German Ephemerides, we have an account of a combat between an enormous serpent and a buffalo, by a person who assures us that he was himself a spectator. The serpent had for some time been waiting near the brink of a pool, in expectation of its prey; when a buffalo was the first that offered. Having darted upon the affrighted animal, it instantly began to wrap it round with

with its voluminous twistings; and at every twist the bones of the buffalo were heard to crack. It was in vain that the poor animal struggled and bellowed; its enormous enemy entwined it too closely to get free; till at length, all its bones being mashed to pieces, and the whole body reduced to one uniform mass, the serpent untwined its folds, to swallow its prey at leisure. To prepare for this, and in order to make the body slip down the throat more glibly, it was seen to lick the whole body over, and thus cover it with its mucus. It then began to swallow it at that end that offered least resistance; while its length of body was dilated to receive its prey, and thus took in at once a morsel that was three times its own thickness. Similar accounts have confirmed this. Whenever they seize and swallow their prey, they seem, like surfeited gluttons, unwieldy, stupid, helpless, and sleepy; they seek some retreat, where they may lurk for several days together, and digest their meal in safety: the smallest effort at that time is capable of destroying them; they can scarce make any resistance, and are equally unqualified for flight or opposition: this is the happy opportunity of attacking them with success.

Serpents have a most horrible fœtor: this proceeds from the putrefaction of their food, which corrupts ere their stomach digests it. Some persons who have opened serpents have been almost suffocated with the stench. To this also contribute two glands near the vent, like those in the weasel or polecat; and, like those animals, in proportion as they are excited by rage or by fear, the scent grows stronger. The rattlesnake and viper have no smell whatever; nay, we are told that at Calcutt and Cranganon, in the East Indies, there are some very noxious serpents whose excrements are sought after, and kept as the most pleasing perfume. The Esculapian serpent is also of this number.

All serpents come from an egg; but in some the egg bursts in the womb, being come to maturity: and these bring forth their young alive, as the viper: while others bring forth eggs, which are afterwards hatched by the heat of their situation; as the common Black Snake, and the majority of the serpent tribe. The number of their eggs is uncertain, as is the time of their coming to maturity. The eggs are not always laid at once, but one by one, at intervals; and often, it is thought, with pain. If either kind is opened, the eggs will be found in the womb, covered with their membranous shell, and adhering to each other like large beads on a string. In the eggs of both, the young ones will be found, though at different stages of maturity: those of the viper will crawl and bite in the moment the shell that incloses them is broke open; those of

the snake are not yet perfect. After they have acquired life, they receive no lessons or cares from their parent, but are left solely to instinct; and perhaps a small proportion reaches maturity. Their length of life is unknown, but probably very long. Father Labat took a viper nine feet long, and ordered it to be opened. In this creature were six eggs, each equal to a goose egg, but longer, more pointed, and covered with a membranous skin, by which also they were united to each other. Each egg contained from thirteen to fifteen young ones, about six inches long, and as thick as a goose quill. Though the female from whence they were taken was spotted, the young seemed to have a variety of colours very different from the parent; and this led the traveller to suppose that the colour was no characteristic mark among serpents. These animals were no sooner let loose from the shell, than they crept about, and put themselves into a threatening posture, coiling themselves up, and biting the stick with which he was destroying them. In this manner he killed seventy-four young ones. Those that were contained in one of the eggs escaped at the place where the female was killed, by the bursting of the egg, and their getting among the bushes.

Though the generality of mankind regard this formidable race with horror, yet there have been countries, and there are some at this day, that consider them with veneration. Their worship by the ancient Egyptians is well known; and many of the nations along the western coast of Africa retain the same unaccountable veneration. On the gold and slave coasts; a stranger, on entering the cottages of the natives, is surprised to see the roof swarming with serpents, that cling there, unmolested and unmolested by the natives. But his surprize increases, farther southward in the kingdom of Widah, when he finds that a serpent is the god of the country, has its habitation, its temple, and its priests: and numbers are daily seen to offer not only their prayers, their goods, and their provisions, at the shrine of their hideous deity, but also their wives and daughters.

Serpents may be distinguished not only by their colours, but by the number, form, size, and arrangement of their scales.

I. The ADDERS, which have a single row of great scales under the belly, and two rows of lesser under the tail. This class includes the viper, the aspic, and adders of various marks.

II. Those which have a single row of great scales under the belly, and also under the tail. This species includes the largest kinds.

III. Those

III. Those which have large scales under the belly and tail, but their extremity is terminated by a moveable and articulated *rattle*.

IV. Those whose scales under the belly and tail are like those of the back.

V. Those encircled by scaly rings, usually called *amphisbena*.

VI. Those whose sides have folds, not ribs, named *cæcilia*.

VII. Those whose body, next the head, shews great scales; then the body shews scaly rings: the tail also shews these rings at its origin, and simple scales at its extremity.

VIII. Those whose skin is replete with little tubercles.

In these should be formed a division of those *viviparous*, properly called vipers; and those *oviparous*. This distinction is not easy to ascertain: but it is suggested that all vipers are venomous; consequently may be distinguished by their fangs, which are always distinct from their teeth. It has been suggested, also, that those which had-fangs were generally, yet with exceptions, on the summit of the head covered with small scales, nearly like those of the back: all others having in that part larger scales, of a very different form, always nine in number, and placed in three rows; the first and second (counting from the nose) composed of two scales, the third of three, and the fourth of two. Not only the colours of serpents vary, between the young and the old; but also the number of scales on their bodies, the oldest having the most. It is vain to attempt their arrangement by colours, as sometimes young of several different colours shall issue from one parent.

OF VENOMOUS SERPENTS IN GENERAL.

THE poison of serpents has ever been one of the greatest objects of human consideration. The glands that serve to fabricate this venomous fluid, are situated on each side the head, behind the eyes, and have canals leading from thence to the bottom of the fangs in the upper jaw, where they empty into a kind of bladder, from whence grow the fangs on each side.

When the serpent is irritated to give a venomous wound, it opens its formidable jaws to their widest extent: the moveable bones of the upper jaw slide forward; the fangs, that lay before inclining, are thus erected; they are struck with force into the flesh of the object bitten; by meeting
resistance

resistance at the points, they press upon the bladders of venom from whence they grow; the venom issues up through the hollow of the tooth, and is pressed out through its slit into the wound which by this time the tooth has made in the skin. Thus, from a slight puncture, and the infusion of a drop of venom scarce larger than the head of a pin, the part is quickly inflamed; and, without a proper antidote, the whole frame contaminated.

If a *viper* inflict the wound, it causes an acute pain in the place affected, attended with a swelling, first red, afterwards livid. This, by degrees, spreads to the neighbouring parts; great faintness, and a quick though low and interrupted pulse, ensues; great sickness at the stomach, bilious and convulsive vomitings, cold sweats, pains about the navel, and death. These symptoms are much more violent, and more rapid, after the bite of a *rattle-snake*; but when the person is bit by the *cobra di capello*, or *naja*, he dies in an hour, his whole frame dissolving into a putrid mass of corruption.

A serpent, having once bitten, exhausts for that time the greatest part of its poison; and, though the wound caused by its biting a second time is attended with malignant symptoms, yet they are much milder than before. A serpent biting upon a sponge, or a piece of soft bread, and then biting immediately after, inflicts a wound not much more dangerous than the prick of a needle. A needle dipped in the venom produces as painful effects as the tooth of the animal itself.

As none of this malignant tribe grow to a great size, they seldom seek the combat with larger animals, or offend others till they are first offended. They lurk in the clefts of rocks, or among stony places; they twine round the branches of trees, or sun themselves in the long grass at the bottom; only seeking repose and safety. If some unwary traveller invades their retreats, their first effort is to fly; but when pursued, or accidentally trod upon, they then make a fierce and fatal resistance. They raise themselves according to their strength upon their tail, erect their head, seize the limb that presses them; the wound is given, and the head withdrawn in a moment. The viper is the only animal in Great Britain from whose bite we have any thing to fear.

THE VIPER

IS the best known among this noxious tribe, and is most frequent throughout Europe; infesting our woods, and often our dwellings. Apparently small, feeble, and innocent, but really dangerous. Without elegance of proportion, or colours: commonly two feet long; tail three or four inches: colour, ash-grey: from his head, down his back, to his tail, a kind of chain of black spots, *zigzag*; on each side, a range of lesser spots, of which each corresponds to the angle of the *zigzag*. The belly is steel-colour; the head narrows near the nose; the scales on the jaws large: number of teeth often eighteen in the upper jaw, twenty-four in the under. On each side, in the upper jaw, one, two, three, or four fangs, white, transparent, hooked, and very sharp; one third or more of an inch long: these are capable of considerable motion, and may be erected or declined at the pleasure of the animal: commonly they are laid down along the jaw, and then their points are not seen; but, to bite, they are erected. Near their base, and connected to their roots, are several resembling them, but smaller, and seemingly designed to replace them if torn away. These fangs are hollow, having two cavities, one on the convex, the other on the concave part of the fang: the first of these opens on the base of the tooth, and at its point; the second at the base, where it receives vessels and nerves: these fangs are also inclosed in a kind of covering during two thirds of their length. The poison of the viper is contained in a bag placed on each side the head, below the muscle of the upper jaw; which muscle, when in action, presses this bag, and squeezes out the venom, which, passing through the cavities in the fangs, reaches the points, and penetrates into the wound. No other venom is in the viper, though some have thought its slaver to be noxious. This poisonous juice is yellow: neither alkali, acid, nor caustic: when dry, splits and divides, to a resemblance of a spider's web: has no effect on animals void of blood, nor on vipers themselves: in warm-blooded animals, its effects are quickest in the smaller species, and in proportion to the quantity injected into the wound, probably also according to the heat of the season, climate, &c. Is dangerous taken internally in sufficient quantity. It acts probably by acrimonious coagulation of some kind; spreads by mingling with the blood: if wounds do not penetrate to the blood, they are safe. The fright attending wounds is often a cause of danger.

The

The eyes of the viper are lively; have eye-lashes: when irritated it opens its jaws, projects its tongue (which is split two thirds of its length), and shakes it with great vivacity; this member is enveloped in a kind of sheath. The jaws of this creature may not only be widely separated from each other, but also the two sides of each jaw are capable of motion independent of each other: this contributes to the easier swallowing of his prey, which, while tightly held by the teeth on one side, is drawn by those of the other side. Feeds on insects, scorpions, lizards, frogs, toads, rats, moles, &c. Sustains hunger long; when captive, will kill, but not eat, even mice, its favourite prey. In cold weather many assemble for mutual warmth. Are often taken clothed with a double skin, the old and the new one; change in spring: come to full growth in six or seven years, but in two or three are capable of reproduction: couple in May; female goes three or four months; sometimes produces twice a year. The eggs in the viper are the size of blackbirds eggs; in two parcels; in number, from one dozen to two: the young ones are rolled round in the egg before their birth. The species is greatly spread, from India to Siberia, and throughout Europe; is always slow of motion; does not bite large animals unless provoked. When held up by the tail, he cannot bite the hand that holds him. The heart of a viper beats long after taken from the body; the mouth opens after the head has been cut off some time, and its wounds are equally dangerous as before. The venom retains its quality after several years keeping. Tobacco, and its essential oil, is fatal to them, as is the oil of cherry laurel.

The *black viper* differs principally in colour, but is much smaller: is the kind best known in England. Vipers are found in many parts of this island; but the dry, stony, and in particular the chalky counties, abound with them. Is chiefly distinguished from the common black snake by the colour, which in the latter is more beautifully mottled; by the head, which is thicker than the body; but particularly by the tail, which in the viper, though it ends in a point, does not run tapering to so great a length as in the other. The viper is slower than most other serpents.

The young continue in the womb till in such perfection as to be able to burst from the shell; and are said by their own efforts to creep from their confinement into the open air, where they continue for several days without taking any food whatever. "We have been often assured," says Mr. Pennant, "by intelligent people, of the truth of a fact, that the young of the viper, when terrified, will run down the throat of the parent, and seek shelter in its belly, in the same manner as the young of the opossum

The Ceraastes.

possum retire into the ventral pouch of the old one. From this," continues he, "some have imagined that the viper is so unnatural as to devour its own young; but this deserves no credit, as these animals live upon frogs, toads, lizards, and young birds, which they swallow whole, though the morsel is often three times as thick as their own body." Of this I have received repeated information; but have never been so fortunate as to meet with a person who had dissected a viper while thus concealing her young; or who had ever seen the young issue from their concealment. Certainly many kinds of serpents devour each other.

Though, when at liberty, they remain torpid throughout the winter; yet, when confined, have never been observed to take their annual repose. Their poison decreases in proportion to the length of their confinement; and it is thought the virtues of their flesh also, which has been esteemed a very powerful restorative medicine in battered constitutions. They are usually taken with wooden tongs, by the end of the tail; but in Yorkshire the viper catchers wear double leather gloves, and worsted ones over them, which they esteem ample security. By the application of olive-oil their bite is said to be effectually cured.

The *Viper of Egypt*, or the *Aspic* of ancient authors, is said to possess a poison which kills without pain; but induces a gentle repose, and then a sound sleep, terminating in death. This is said to have been therefore chosen by Cleopatra.

The *AMMODYTES* hides in the sand; its venom often kills in three hours time. This kind, in Africa, after having eaten their prey, fall into so sound a sleep, that they are not waked without difficulty, but lie in the paths and are trod on.

The *CERASTES* is singular by its horns: was well known to the ancient Egyptians, and inserted among their hieroglyphics. Its horns are moveable at the will of the animal; are placed exactly over the eyes; are a little bent. The head of the Cerastes is flat; nose thick and short; general colour yellow; deeper-coloured blotches, in the form of bands, on the body; deepest on the back. About two feet long; tail short; is very greedy, and devours much: then sleeps, and is easily killed. Many devoured by eagles, and other birds of prey; yet they have reputation for cunning, and for hiding themselves to seize their prey at advantage.

The NAJA, or *Spectacled Serpent*, is among the most beautiful by his colours, and the most fatal by his poison. Far from supposing him noxious, he may be viewed with pleasure and admiration. On the back of his neck is placed a curved stripe, which rising in the middle, and turning up at the ends, has some resemblance to eyes, or to those kind of spectacles which are mounted on the nose: in reality, however, the eyes and nose of this serpent are at his snout. General colour yellow; a broad band of brown on the junction of the neck and body; whitish under the belly; the spectacles are a white stripe, bordered by deep-coloured stripes. The upper part of his head has nine large scales, disposed in four rows; two in the first, two in the second, three in the third, and two in the fourth; yet this serpent is an exception to a rule given, and among the most venomous. Eyes lively and fiery; scales oval, flat, and lengthened; attached to the skin only at one part, and capable of considerable erection; are not so close as to touch each other on the inflated part of the neck, but form rows, and shew the skin between them. These scales in the sun-shine glitter like burnished gold. The inflation of the neck is formed by the ribs, which here are longer than elsewhere, and are covered by a loose membrane, which the serpent can dilate at will: this he does especially when angry; at which time he is erect, and holds his head horizontally: this has the appearance of a hood, or coronet; whence he has been called the *hooded serpent*. The female has this extension, but not the spectacles. Generally three or four feet long, or more, some seven or eight. Ferocious and fatal; his poison produces convulsions or gangrene, which are speedy death.

Greatly feared by the Indians; yet their mountebanks educate him to dance, and as a show: going from city to city, and pretending to be preserved by virtue of a certain root. They take their serpent out of the vase in which he is kept; then presenting a stick, or often the fist only, he raises himself on his tail, swelling his *hood*, opening his chaps, and thrusting out his forked tongue, hissing; his eyes sparkling, and his actions lively; he begins a kind of combat against his master, who presenting his fist now to the right, now to the left, produces corresponding motions in the serpent; and to this he gives the idea of a dance, by singing and moving himself. The Naja endures this exercise for several minutes; but when his master perceives that his anger becomes serious, he withdraws his hand, ceases to sing, the serpent lies down, and the show is over. The serpent is brought to this by having been long accustomed to similar provocation; and, when striking at the fist, his vase is presented

The Spectacled Serpent.

presented quickly instead of it, against which he bruises his nostrils, and hence becomes wary. Beside this, his keeper makes him frequently bite a piece of rag, or other soft matter that may imbibe his venom; and they retard the fresh growth of this venom, by keeping him from moist food. Is worshipped on the coast of Malabar. Called by the Portuguese *Cobra di capello*.

There is a speckled serpent in Peru. One in Brazil, whose mark is rather heart-shaped, than like spectacles.

The **YELLOW SERPENT** of Martinico is remarkable for two orifices between his eyes and nose, which are thought to lead to the organ of hearing: if this be true, he is herein singular. His venom is deadly; limpid as water, but yellowish, like olive oil beginning to change. He is sleepy, especially if the air be cool; hides under parcels of leaves, in old trees and holes; is very fetid, and generally followed by certain birds who give the alarm. When a person is surprised by this serpent, to present him a branch of a tree, a parcel of leaves, or any such object, takes off his attention, and gives time for self-defence. Often a single blow kills him. After the head is cut off, the body preserves for some time a vermiculated motion. Six feet long; three inches in diameter.

The *Whip Snake* is native of the East, about five feet long, yet not much thicker than the thong of a coachman's whip. It is exceedingly venomous; and its bite is said to kill in about six hours. To this formidable class might be added the Asp; the Jaculus of Jamaica also, one of the swiftest of the serpent kind; the Hæmorrhoids; the Coral Serpent, which is red, and whose bite is said to be fatal; and a number of others, some very partially known, many scarce at all. To remedy the bite of these animals, the Indians use a composition called in Europe *Pietro de Cobra*, or the Serpent Stone; and which, applied to the wound, is said to draw out the venom. The composition of this stone, for it is an artificial substance, is kept a secret; and perhaps its effects in extracting the venom may be imaginary: nevertheless, it is certain that it has a power of sticking to the skin, and sucking a part of the blood from the wound. Some maintain it has great virtues, others doubt them altogether.

OF SERPENTS WITHOUT VENOM.

SERPENTS without poison may be distinguished from those that are venomous, by their wanting the fang teeth : their heads also are not so thick in proportion to their bodies ; and in general they taper off to the tail more gradually in a point. Their teeth are short, numerous, and in the smaller kinds perfectly inoffensive ; they lie in either jaw, as in frogs and fishes, their points bending backwards, the better to secure their prey. As instruments of defence, they never attempt to use them. Even among the largest, the teeth are never employed in desperate engagements. When a hare or a bird is caught, they may serve to prevent such small game from escaping ; but when a buffalo or a tiger is to be encountered, it is by strong folds of the body, by fierce verberations of the tail, by twining round, and drawing the knot with convulsive energy.

T H E S N A K E.

HITHERTO this kind of creatures has furnished only mischievous reptiles, whose mortal poisons, though hidden, were dreadful ; ministers of death, counteracting the principles of life. But we must not thus consider all that belong to it ; on the contrary, the *green and yellow snake* of France is said to be mild, gentle, and even familiar ; his colours are splendid and beautiful ; and it is not uncommon to see children tie two by the tails, and drive them, in imitation of coach-horses, where they please, not only without resistance from the creatures, but with seeming pleasure. They even acquire an affection for those who keep them : we are told of one who knew its mistress's voice and manner of laughing ; came when called ; followed by her side when walking, as if waiting orders ; glided around her arms, as if caressing her : at length he was thrown into a river to swim, while his mistress followed in a boat ; to this he kept close for some time, ever attentive to the voice of his mistress ; till the turn of the tide proved too powerful, and he was drowned. Is three or four feet long. Oviparous.

The *Common Snake* in England is of the same nature; remarkably fond of milk, and is said to suck cows when lying down.

The *Black Snake* is the largest of English serpents, sometimes exceeding four feet in length. The neck is slender; the middle of the body thick; the back and sides covered with small scales; the belly with oblong, narrow, transverse plates: the colour of the back and sides is a dusky brown; the middle of the back marked with two rows of small black spots, running from the head to the tail; the plates on the belly are dusky; the scales on the sides are of a blueish white; the teeth are small and serrated, lying on each side of the jaw in two rows. The whole species is perfectly inoffensive; taking shelter in dunghills, and among bushes in moist places; from whence they seldom remove, unless in the midst of the day, in summer, when they are called out by the heat to bask themselves in the sun. If disturbed or attacked, they move away among the brambles with great swiftness; but, if too closely pursued, they hiss and threaten, and thus render themselves formidable, though incapable of offending.

Preys upon frogs, insects, worms, mice, and young birds; and, considering the smallness of the neck, it is amazing how large an animal it will swallow. The black snake of Virginia, which is larger than ours, and generally grows to six feet long, takes a prey proportionable to its size; partridges, chicken, and young ducks. It is generally found in the neighbourhood of the hen roost, and will devour the eggs even while the hen is sitting upon them: these it swallows whole; and often, after it has done the mischief, will coil itself round in the nest.

Are oviparous, excluding eighty or an hundred eggs at a time, which are laid in dunghills or hot-beds; the heat of which, aided by that of the sun, brings them to maturity. During winter they lie torpid, in banks or hedges, and under old trees.

THE LADIES' SNAKE

SEEMS to enjoy a name which unites contrary ideas; few of the fair sex, in these climates, being fond of this genus of animals: but, on the coast of Malabar, the ladies caress this snake, warm him in their bosoms, keep him there without fear, and the little creature seems sensible of their good-will, and returns caress for caress: this is during the rainy

rainy season, when the snake is apt to be chilled by the too great freshness of the air: During the heats, they receive from him a contrary service, and his coolness is then to them refreshing; his polished scales being always cooler than the atmosphere. Is beautiful black and white, highly lustrous; he is not fearful, nor flies when approached. Is but small.

This is not the only serpent familiar with the human race. In some countries, where such reptiles are common, while they destroy serpents of one kind with great animosity, they take others into their houses and bosoms with affection. The *Esculapian Serpent* of Italy is among this number. It is suffered to crawl about the chambers, and often into the beds. It is a yellow serpent, about an ell long; familiar and innocent, yet will bite when exasperated. They are said to be great destroyers of mice; and this may be one reason why they are taken under human protection. The Boiga of Ceylon (it inhabits both continents also) is equally a favourite among the natives; and they consider the meeting it as a sign of good luck. They consider themselves as extremely happy if this animal comes into their huts. The colours of this serpent are so many and beautiful, that they surpass description; and these perhaps are the chief inducements to the savages to consider its visits as so very fortunate. An equal favourite is the Japanese Prince of Serpents. The scales on the back are reddish; finely shaded, and marbled with large spots of irregular figures mixed with black. The fore part of the head is covered with large beautiful scales, the jaws bordered with yellow, the forehead marked with a black marbled streak, and the eyes handsome and lively.

T H E N A B O I E,

THOUGH not hurtful by its poison or its fangs, is yet among those most injurious to mankind, as it is the object of idolatry among the inhabitants of Whida, on the coast of Africa, where he has his temples, his altars, his priests, his donations, and his devotees; including a selection of beauty enjoyed in his name, but not by himself.

He is whitish on his upper parts; with great oval spots, reddish, bordered black or brown, which lie in three rows from head to tail, the scales on his head resembling those on his back; yet he is not venomous.

The Boiguacu.

The Python

Length three to four feet. Where he resides, animals that might injure him are forbidden; particularly the hog, though so useful a quadruped in devouring noxious serpents, lest he should devour their GOD. He is familiar to man; but has the reputation of attacking venomous serpents, insects, and worms, which overrun that country: nor is he less esteemed for miraculous assistance in battle, in arts, commerce, and good fortune.

THE BOIGUACU

IS the largest serpent in the world; of that kind which has the scales on its tail and belly similar; has no venom, but ample strength to counterbalance its absence. Nature has bestowed on this reptile, beauty, size, agility, strength, and industry. As the elephant among quadrupeds, he surpasses the rest of his order. Is commonly twenty feet long, but sometimes forty or fifty, where food and quiet permit his growth.

His head resembles that of a setting dog; the summit is wide; the forehead raised, and divided by a longitudinal hollow; his eyes are large, their orbits projecting; his mouth opens very wide; his teeth are long. This enormous reptile is distinguished by the beauty of his scales, and the vivacity of their colours, which vary according to climate, age, and sex. On the head he has a great deep-coloured or black spot; others are regularly ranged down him: belly ash-coloured yellow, spotted black. His hissings are long, sharp, and frightful: these are thought to be most frequent before storms and tempests, perhaps before pestilential distempers which arise from the atmosphere; and therefore these have terrified into superstition the natives of Mexico, who consider this reptile as a messenger of divine wrath; and floods of human gore have been offered to his image. In Africa also he is no less terrifically worshipped, on the coast of Mosambique, and in Japan.

Inhabits all countries hot enough to maintain him, fertile enough to furnish him with prey, and spacious enough to prevent his being frequently molested; formerly was known more northerly, when woods were more abundant on this side the Mediterranean. In Africa, the only mean of destroying him is by fire: steel avails little: but often fire is set to the long grass, &c. already scorched by the burning sun; this

soon spreads, and interposes a barrier which stops his pursuit. He swims readily, even in agitated waves, in rivers, or arms of the sea; he mounts the highest trees with rapidity; and, stationed at various heights, often waits in ambush the approach of prey, leaping from tree to tree. Some eat fish, and all devour whatever they can conquer. A stroke of his tail will knock down a man. He devours tigers and cougars. His manner of feeding, and condition after it, we have already noted: his inactivity is so fixed, that travellers have walked over him (covered as he is with leaves, &c.), or reposed upon him, without his moving; nor has he given signs of life till the heat of their fire has reached him. Often large animals are placed as baits for him, and he is knocked on the head after his meal. The negroes eat his flesh, which they highly relish. In other countries they wear his skin for clothing or ornament, as did the heroes of antiquity. Sheds his skin after the rainy season; and then the sexes seek each other. The egg from whence issues this monster, is but two or three inches long, hatched by the sun's heat. Its length of life unknown, probably very great; since to reach his ordinary dimensions, must require many years.

There are others of this kind (for indeed it includes the largest of the serpent tribe); but none equal, or nearly equal, in size or voracity.

THE RATTLE-SNAKE.

THE lion, by his roar, is not more terrific to the surprised traveller, than this snake by his rattles and his fetid smell; his poison is not less destructive than that of the Naja.

Is peculiar to America, which it inhabits from north to south. Some are as thick as a man's leg, and six feet in length; but their most usual size is from four to five feet long; tail four inches. In many particulars it resembles the viper; having a flattened head, covered near the nose with six scales, larger than their neighbours, disposed in three rows cross-wise, two in each row. The throat is large; the tongue black, thin, forked; partly covered, and very mobile and agitable. The two bones of the sides of the jaws are not united in front, but admit of separation: its teeth turn backward, are largest next the nose; their fangs resemble those of the viper. The eye sparkles and shines, in the dark; is furnished with a nictitating membrane, that preserves it from dust. Its

Rattle - Snake

Plate I.

Rattle-Snake.

scales are of a considerable degree of hardness, oval, and rising in the middle. A single row of scales under both tail and belly. They are orange-tawny, and blackish-coloured on the back; and of an ash-colour on the belly, inclining to lead, with black spots. The male may be readily distinguished from the female, by a black velvet spot on the head, and by the head being smaller and longer. But that which is peculiar to them is the rattle at the end of their tail, by which they make a loud rattling noise when they move.

This rattle is composed of several pieces, from one to thirty, alike in form, and often in size; brittle, elastic, semi-transparent, and of the same nature as the scales; pyramidal, having four sides, two opposite larger than two others; that next the body incloses the latter vertebra of the tail; is formed upon them, and separated from them by a very thin membrane, so as to fit them exactly. Are hollow; each piece locks into another, being inclosed two thirds of its length in its successor, yet so as to play freely in it. Neither nerve nor muscle attaches any of these rattles (except that next the tail) to the serpent's body, but an exterior covering includes them: the furthest is formed first, the *internals* afterwards, pushing that off gradually; the whole are very dry and brittle, and rattle by striking each other: their noise resembles the crackling of parchment; may be heard fifty or sixty feet distance: it were desirable that the distance were greater.

It is supposed by some that the snake acquires an additional bone every year; and that from hence its age may be precisely known: but this is very uncertain, especially as they easily break off. However this be, snakes of a year or two old have no rattles; while many old ones have been killed that had from eleven to thirteen; and tradition says, formerly some had thirty or more. They shake these rattles with prodigious quickness when disturbed; yet the peccary and the vulture, no way terrified, hasten at the signal to seize the snake, as their favourite prey.

It moves along with the most majestic rapidity; neither seeking to offend, nor fearing insult. Unprovoked, it meddles only with its natural prey; but when accidentally trod upon, or pursued, it makes a dreadful and desperate defence. It folds itself into a circle, erects itself on its tail, throws back its head, and inflicts its wound in a moment; then parts, and inflicts a second wound. The instant the wound is inflicted, though small, it appears more painful than the sting of a bee. This pain, which is so suddenly felt, far from abating, grows every moment more excruciating and dangerous: the whole body swells; the venom reaches the

head, which is soon of a monstrous size; the mouth is too small to contain the swelling tongue; the eyes are red and fiery; the heart beats quick, with frequent interruptions; the pain becomes insupportable; devouring thirst torments the patient, and water or drink makes it worse; the spittle becomes bloody: and some expire under it in five or six hours; but others, who are of stronger constitutions, survive the agony for a few hours longer, only to sink under a general mortification which ensues, and corrupts the whole body. Sometimes ten minutes time is fatal. One that was teized and irritated to bite himself, died in twelve minutes.

Several remedies have been tried to alleviate this calamity. A decoction of the Virginian seneka, or snake-root, is considered as the most effectual. The Indians dip their arrows in the poison under the rattle-snake's fangs, when they desire to take a signal revenge on their enemies. The Indians eat them, seizing them by the head, in cool weather. They do not quit their retreats till after all the snow is melted; at this time they are pursued with little or no danger. In summer they prefer hilly countries, and warm exposures on the south aspect of a hill: hide sometimes under fallen trees, so that the Americans do not cross them if they can help it; if they must, they leap off from them as far as possible.

Eats worms, frogs, hares, squirrels, birds, &c. Climbs trees with facility; leaps from branch to branch, or from rock to rock; on level ground moves with heavier motion. With regard to his charming his prey, when out of reach, opinions are divided; some referring it to the fire and vivacity of his eyes, some to their being overcome by his fœtor; some think there is no such thing, but that they have been previously bitten, and escaped; yet, being poisoned, he awaits the effect. During rain and thunder he is most dreadful (not that he fears water, for he swims well), especially as then his rattles do not sound. Has a formidable enemy in a snake as large as itself, which is very strong, and twists itself round him with such contractile force as to squeeze him to death; hence this snake is called *constrictor*: it is not venomous, therefore its breed is encouraged. Who can tell but that in time, by the exertion of so many enemies, men, hogs, vultures, and fellow snakes, a rattle-snake might be considered as an animal merely ideal, or found only in cabinets.

There are other serpents having rattles in their tails. Such are the *Millet*, whose head has nine scales on it; general colour, grey: a small kind. The *Dryinas*, whitish, spotted, and yellow. The *Durissus*. And the *Piscivorous*, which has properly no rattle (*i. e.* of many bones), but whose tail terminates in a boney or cornified point, not an inch in length;

length : five or six feet long : he hangs on branches of trees that are suspended over streams, and darts down on fish that are passing : pursues and seizes them in the water, and brings them to land to devour : sometimes falls in the same manner on men.

THE BLIND WORM.

THE Blind Worm is a harmless reptile, with a formidable appearance. Has nine large scales on his head ; first one, then two ; a third and fourth row, three each : his scales are very small : his tail is longer than his body : the bones of his under jaw are not separated, as in most serpents. The usual length of this species is eleven inches, but in some countries three feet. The eyes are red ; the head small ; the neck slender ; from that part the body grows suddenly, and continues equal, to the tail, which ends quite blunt : the colour of the back is cinereous, marked with very small lines, composed of minute black specks ; the sides are of a reddish cast ; the belly dusky, and marked like the back. The motion of this serpent is slow : from which, and from the smallness of the eyes, are derived its names ; some calling it the Slow, and some the Blind Worm. Like all the rest of the kind, in our climates, they lie torpid during winter ; and are sometimes found, in vast numbers, twisted together. The most remarkable property of this serpent is, that when irritated it becomes as stiff as a board ; and, if smartly struck in this state, is easily broken ; its muscles being composed of fibres that readily separate. Hence it is called by some the *Glass Snake*, and by LINNÆUS *Anguis fragilis*.

THE AMPHISBENÆ

ARE easily distinguished from all other serpents, as they have, properly speaking, no scales, but rings round their bodies : their upper and under sides are so similar, that, were their head and vent hidden, their
their

their back or belly could not be distinguished. This peculiarity of rings gives them great facility in many motions of which other serpents are incapable; and by offering no impediment either way, but almost equal assistance, they can move forward or backward at pleasure. Their tail is as round as their head; so that, when moving backward, no wonder they have been supposed to have a head at each end. That best known is the *SMOKY*: almost black, mingled with white: a foot or two in length, but scarce two inches of tail; his eyes very small, covered by a membrane. Inhabits Ceylon and America. Eats worms, insects, beetles, &c.; is fond of ants. His skin is very hard, and his muscles strong; has no fangs, consequently is not venomous.

Another of this kind is *WHITE*, and often spotless.

Of serpents with tubercles only one kind is known: native of Java.

The *Langaba* of Madagascar is divided, in its length, into three different parts, by so many different kinds of scales: has also a horned kind of snout projecting. Is very venomous.

O F F I S H E S.

IT has been thought that all fish are naturally of the ocean; and that some have mounted into fresh water by accidental migration; yet, as many cannot live in salt water, this is at least doubtful. A few, indeed, swim up rivers to deposit their spawn; but the great body of fishes keep to the sea, and would quickly expire in fresh water.

The number of fish which we have named, and whose figure we know, according to Linnæus, is above four hundred. But of the greatest part of these we know very little besides their figure. Those qualities, singularities, or advantages, that render animals worth our attention, are undiscovered. The history of fishes, therefore, has little in it entertaining: and will detain us proportionably less than any subject yet introduced.

Most fish offer the same external form, sharp at either end, and swelling in the middle, by which they are enabled to traverse the fluid which they inhabit, with greater celerity and ease. Every part seems exerted in this dispatch; the fins, the tail, and the activity of the whole back-bone; and to this flexibility fishes owe their great velocity. The fins assist not only in progression, but in rising, sinking, turning, or even leaping out of the water. The *pectoral* fins, like oars, push the animal forward; they are placed behind the opening of the gills; generally large and strong; and are to fish in the water what wings are to birds in the air. They also balance the fish's head, when large, and keep it from tumbling prone to the bottom; as is seen in large-headed fishes, when the pectoral fins are cut off. Next these are the *ventral* fins, toward the lower part of the body, under the belly: these always lie flat on the water; and serve to raise or depress the fish. The *dorsal* fin is situated along the ridge of the back; keeps it in equilibrio, and also assists progressive motion: In many this is wanting; but in all flat fishes it is very large, as the pectoral fins are proportionably small. The *anal* fin lies between the anus and the tail; and serves to keep the fish upright. But the tail, which in some is flat, in others upright, seems the grand instrument of motion: the fins are subservient to it, and direct its impetus.

To explain this by experiment—A carp put into a large vessel, in a state of repose, spreads all its fins, and seems to rest on its pectoral and ventral fins near the bottom. If the fish folds up either of its pectoral fins, it inclines to

that side : folding the right pectoral fin, the fish inclines to the right side ; folding the left fin, it inclines to the left side. If the fish desires a retrograde motion, striking with the pectoral fins, in a contrary direction, produces it. If the fish desires to turn, a blow from the tail turns it ; but if the tail strike both ways, the motion is progressive. In pursuance of these observations, if the dorsal and ventral fins be cut off, the fish reels to right and left, and endeavours to supply the loss by keeping the rest of its fins in constant employment. If the right pectoral fin be cut off, the fish leans to that side ; if the ventral fin on the same side be cut away, then it loses its equilibrium entirely. When the tail is cut off, the fish loses all motion, and gives itself up to where the water impels it. Each of these fins has its peculiar use ; but all conspire to assist each others motions. Some fish are possessed of all, whose motions are yet not the swiftest. Their number, size, and situation, seem calculated rather to correspond with the animal's figure, than solely to answer the purposes of speed. Where the head is large and heavy, the pectoral fins are large and forward. Where the head is small or long, the pectoral fins are small, and the ventral fins wanting.

Inhabitants of the water are covered with a slimy glutinous matter (a secretion from the animal's body), that defends their bodies from the immediate contact of the surrounding fluid, and contributes to their easy progress through the water. Beneath this, in many kinds, is a strong covering of scales, a still more powerful defence ; and under that, before we come to the muscular parts of the body, an oily substance, which supplies, or rather which *includes*, the requisite warmth.

Nature seems to have bestowed on these animals appetites and powers of inferior kinds. Formed for passive existence in their obscure and heavy element, to preserve this existence, and to transmit it, is their whole pursuit and enjoyment. Impelled rather by necessity than choice, and mechanically excited to every fruition, they chase without distinction whatever they can swallow, conquer, or enjoy.

A ceaseless desire of food seems their ruling impulse, and prompts them to encounter every danger. Their rapacity seems insatiable. Even when taken out of the water, and almost expiring, they greedily swallow the very bait by which they were allured to destruction.

The maw is, in general, placed near the mouth ; and, though possessed of no sensible heat, is however endued with a surprising faculty of digestion, seeming in some measure to increase with the quantity of food. It digests not only fish, but prawns, crabs, and lobsters, shells and all ; though these shells are so much harder than the sides of the stomach
which

which contains them. This amazing faculty has justly excited curiosity; and seems to suggest some principle in the stomach, yet unknown, which acts in a different manner from all kinds of artificial maceration; and which is lodged in fishes in a greater degree than in other creatures. Ever hungry, and ever prowling, yet no animals can suffer abstinence so long. The gold and silver fish we keep in vases seem never to want nourishment: whether they feed on water-insects too minute for our observation, or whether water alone is a sufficient supply, is not evident; but they are often seen for months without apparent sustenance. Whatever living thing fishes are able to swallow, becomes their food. Some, that have very small mouths, feed upon worms and spawn of other fish: others, whose mouths are larger, seek larger prey. Those with the largest mouths pursue almost every thing that has life; and often meet each other in fierce opposition; when the fish with the largest swallow enjoys the victory, and devours its antagonist.

Thus the life of a fish is one scene of hostility, violence, and evasion. The smaller fry escape, by swimming into those shallows where the greater are unable to pursue. Yet, even in the shallows, the mussel, the oyster, and the scallop, lie in ambush at the bottom, with their shells open; and whatever little fish inadvertently approaches into contact, they close their shells upon, and devour. The pursuit of fishes is not confined to a single region, or to one effort: shoals of one species follow those of another through vast tracts of ocean, from the vicinity of the pole down to the equator. The cod, from the banks of Newfoundland, pursues the whiting even to the shores of Spain. The cachalot pursues herrings, and swallows thousands at a gulp.

This may be one cause of the annual migration of fishes; but fishes may be induced to change their place of residence for one more suited to their constitutions, or more adapted to depositing their spawn. No fish are fond of *very cold* water, but frequent places where it is warmest. In summer, they assemble in the shallows where the sun has power to warm the water to the bottom; in winter, they are found deeper.

All fish require air for their support. The whale kind breathe, and come to the surface every two or three minutes for fresh inspiration: but those which continue entirely under water, if totally deprived of air, will expire in a very few minutes. Thus all the fish of a pond die, when the ice every where covers the surface, and keeps off the air. If a hole be made in the ice, the fish will be seen to come all to that part, for the

benefit of a fresh supply : yet nothing is more difficult to be accounted for than the manner in which they obtain this supply. Fish in the water have a motion of their lips and gills, or at least of the bones on each side that cover them. This motion is, without doubt, analogous to our breathing ; yet it is not air, but water, that the fish actually sucks in. Their manner of breathing is probably thus : The fish first takes a quantity of water at the mouth, which is driven to the gills ; these close, and keep the water so swallowed from returning by the mouth ; while the bony covering of the gills prevents it from going through them, until the animal has drawn the proper quantity of air from the water thus imprisoned : then the bony covers open, and discharge it ; the gills also admit a fresh quantity of water. Should the fish be prevented from the free play of its gills, or should the bony covers be kept from moving, by a string tied round them, the animal would fall into convulsions, and die.

The air-bladder may serve to contain this air for vital purposes ; as well as contribute to enabling the fish to rise and sink in the water at pleasure, as it is dilated or compressed. The air-bladder is a bag filled with air, sometimes composed of one, sometimes of two, and sometimes three divisions, situated towards the back of the fish, and opening into the maw or the gullet. Some fish have an air-bladder that continually crawl at the bottom, such as the flounder ; and some are without it that swim at ease in every depth ; such as the anchovy and gudgeon. Its necessity then is not always equally strong.

“ Most of the disorders incident to mankind,” says Bacon, “ arise from the changes and alterations of the atmosphere : but fishes reside in an element little subject to change ; theirs is an uniform existence ; their movements are without effort, and their life without labour. Their bones also, which are united by cartilages, admit of indefinite extension ; and the different sizes of animals of the same kind among fishes is very various. They still keep growing ; their bodies, instead of suffering the rigidity of age, which is the cause of natural decay in land animals, still continue increasing with fresh supplies ; and, as the body grows, the conduits of life furnish their stores in greater abundance. How long a fish, that seems to have scarce any bounds put to its growth, continues to live, is not ascertained ; perhaps the life of a man would not be long enough to measure that of the smallest.”

When a fish's scale is examined through a microscope, it will be found to consist of a number of circles, one circle within another, in some measure resembling those which appear upon the transverse section of a tree,

tree, and supposed to offer the same information: for, as in trees we can tell their age by the number of their circles, so in fishes we can tell theirs by the number of circles in every scale, reckoning one ring for every year of the animal's existence. By this method M. Buffon found a carp, whose scales he examined, to be not less than an hundred years old. Gesner brings us an instance of one of the same age; and Albertus of one more than double that period. The age of the skate and the ray, that want scales, may be known by separating the joints of the back-bone, and then minutely observing the number of rings which the surface, where it was joined, exhibits. But these methods may be, and probably are, very imperfect.

But their longevity is nothing, compared to their fecundity. All (a few of the larger excepted) multiply by hundreds, and some by millions. Some bring forth their young alive; some produce eggs: the former are the least fruitful, yet even these produce two or three hundred at a time. Those that produce eggs, which they leave at the bottom of the water, or floating on the surface, are much more prolific: of these eggs few rise to life; they are devoured by the lesser fry, by aquatic birds, and by the larger fish. Still, however, there are enough for supplying the deep with inhabitants. The cod spawns in one season, as Lewenhoeck assures us, above nine million of eggs, or peas, contained in one single roe. The flounder is commonly known to produce above one million; and the mackarel above five hundred thousand. Such an amazing increase, if permitted to come to maturity, would overstock nature, and the ocean itself would not be able to contain the half of its inhabitants. But two wise purposes are answered by this amazing increase; it preserves the species in the midst of numberless enemies, and serves to furnish the rest with a sustenance adapted to their nature.

Fish have different seasons for depositing their spawn: some that live in the depths of the ocean, are said to choose the winter; but in general they choose summer. They leave the ocean, and shoal round the coasts, or swim up the fresh-water rivers, which are warm as they are comparatively shallow. When they have deposited their burthens, they then return to their old stations, and leave their nascent progeny to shift for themselves.

The spawn continues in its egg-state in some fish longer than in others, and this in proportion to the animal's size. In the salmon, the young continue in the egg from the beginning of December till the beginning of April; the carp continues in the egg not above three weeks; the little

gold fish from China is still quicker. These at first escape by their minuteness and agility. They rise, sink, and turn; much readier than grown fish; and they can escape into very shallow waters when pursued.

But there are some that have all the tenderness of birds or quadrupedes for their young; that nurse them with constant care, and protect them from every injury: of this disposition are the *cetaceous* or whale kind; they bring them alive into the world, and defend them with courage and activity: also, in part, the *cartilaginous* kinds, which have gristles instead of bones. But the tribe we have been describing, that leave their spawn without protection, are called the *spinous* or bony kind, from their bones resembling the sharpness of thorns.

The *cetaceous*, the *cartilaginous*, and the *spinous*, differ from each other in conformation, appetites, bringing forth, and in the education of their young. These three great distinctions are strongly and firmly marked in nature.

OF CETACEOUS FISHES.

THIS tribe comprises the Whale, the Cachalot, the Dolphin, the Grampus, and the Porpessé. All these resemble quadrupedes in their internal structure, and in some of their appetites and affections. They have lungs, a midriff, a stomach, intestines, liver, spleen, bladder, &c. Their heart also resembles that of quadrupedes, with its partitions closed up, as in them, and driving red and warm blood in circulation through the body. Every internal part bears a most striking similitude; and, to keep these parts warm, the whole kind are covered, between the skin and the muscles, with a thick coat of fat or blubber, like the bacon-fat of a hog. As these animals breathe, they are constrained, every two or three minutes, to come up to the surface to take breath, as well as to spout out through their nostril what water they have sucked in. This conduit is placed in the head, a little before the brain. Though externally the hole is single, it is internally divided by a bony partition, which is closed by a sphincter muscle on the inside, that shuts it up at the pleasure of the animal. Another muscle or valve prevents the water from going down the gullet. When therefore a quantity of water is necessary to be discharged, it shuts the

the mouth, closes the valve of the stomach, opens the sphincter at the nostril, and then breathing strongly, drives out the water.

Their eyes have eyelids, as in man; it is most likely that they can hear, as they certainly utter sounds, and bellow to each other. This vocal power would be needless to animals naturally deaf. The female suckles in the manner of quadrupedes, her breasts being placed above the navel.

The number of their fins never exceeds three; *i. e.* two pectoral fins, and one back fin; but in some sorts the last is wanting. These fins are made up of bones and muscles; and their skeleton resembles that of a man's hand. Their tails also are placed so as to lie flat on the surface of the water; not upright or edgeways. This flat position of the tail enables them to force themselves suddenly to the surface.

Some are without teeth, properly called whales; others have teeth only in the lower jaw, and are called by the French *cachalots*: the nar-whal has teeth only in the upper jaw; the dolphin, porpessé, and grampus have teeth both above and below.

OF THE WHALE.

WE now no longer hear of whales two hundred, and two hundred and fifty feet long, which were often seen two centuries ago. They have been destroyed by mankind, and the species is dwindled into a race of diminutive animals, from thirty feet to eighty. Taking the whale at his ordinary size of eighty feet long and twenty feet high, what an enormous animated mass it appears! Yet this great creature gambols in the deep, with the ease and agility of the smallest animal, and makes its way with incredible swiftness! Though this be wonderful, perhaps greater wonders are concealed in the deep. Who knows the size of those that remain constantly under water, and that have been increasing in magnitude for centuries? to receive all that has been said of the sea-serpent, or the Kraken, would be credulity; to reject all, or to deny the possibility of their existence, would be presumption.

The whale is the largest animal of which we have any certain information; there are seven different kinds; the Great Greenland Whale, without a back fin, and black on the back; the Iceland Whale, without a back fin, and whitish on the back; the New England Whale, with a hump on the back; the Whale with six humps on the back; the Fin-fish,

with a fin on the back near the tail; the Pike-headed Whale, and the Round-lipped Whale. The fin-fish having a larger swallow than the rest, is more active, slender, and fierce, living chiefly upon herrings. However they are none of them very voracious.

The Great Greenland Whale is the fish the taking which is such an object in different-parts of Europe. It is a large heavy animal, and the head alone makes a third of its bulk. The fins on each side are from five to eight feet, composed of bones and muscles. The tail about twenty-four feet broad; and when the fish lies on one side, its blow is tremendous. The skin is smooth and black, and, in some places, marbled with white and yellow; which, running over the surface, has a very beautiful effect. This marbling is particularly observable in the fins and the tail.

The whale uses only the tail to advance in the water, and it is surprising to see with what force and celerity its enormous bulk divides the ocean. The fins are only used for turning, and directing the velocity impressed by the tail. The female also uses them, when pursued, to bear off her young, clapping them on her back, and supporting them by the fins on each side from falling.

The outward or scarf skin of the whale is no thicker than parchment; but, this removed, the real skin appears, an inch thick, and covering fat or blubber from eight to twelve inches in thickness; of a beautiful yellow. The muscles lie beneath; and these, like the flesh of quadrupeds, are very red and tough.

The mouth is above twenty feet long, the upper jaw furnished with barbs, the greatest in the middle, the smallest toward the sides. These are the whale-bone; the longest spars of which are eighteen feet. The tongue is almost immoveably fixed to the lower jaw, seeming one great lump of fat; and, in fact, it fills several hogheads with blubber. The eyes are not larger than those of an ox; and when the crystalline humour is dried, it does not exceed a pea. They are placed towards the back of the head, being the most convenient situation for enabling them to see, both before and behind; as also to see over them, where their food is principally found. They are guarded by eye-lids and eye-lashes, and they seem to be very sharp-sighted. As soon as the thin scarf-skin above mentioned is removed, a black spot is discovered behind the eye; under that is the auditory canal, leading to a regular apparatus for hearing. In short, the animal hears the smallest sounds at very great distances, and

at all times, except when it is spouting water; which is the time that the fishers approach to strike it.

The spout-holes or nostrils in this whale are two; one on each side the head, before the eyes, and crooked, somewhat like the holes on the belly of a violin. From these holes this animal blows the water very fiercely, and with such a noise that it roars like a hollow wind, and may be heard at three miles distance. When wounded, it then blows more fiercely than ever, so that it sounds like the roaring of the sea in a great storm.

The real bones are hard, like those of great land animals, very porous, and filled with marrow. Two great strong bones sustain the under lip, lying against each other in the shape of a half-moon: some of these are twenty feet long.

The whale goes with young nine or ten months, and is then fatter than usual, particularly when near the time of bringing forth. The cub, when excluded, is black, and about ten feet long. When she suckles her young, she throws herself on one side, on the surface of the sea, and the young one attaches itself to the teat. The breasts are two, generally hid within the belly; but she can produce them at pleasure, so as to stand forward a foot and a half, or two feet; and the teats are like those of a cow. In some, the breasts are white; in others speckled; in all, filled with a large quantity of milk, resembling that of land animals. The young continue at the breast for a year; during which time they are called by the sailors *short-heads*. They are then extremely fat, and yield above fifty barrels of blubber. The mother, at the same time, is equally lean and emaciated. At the age of two years they are called *stunts*, as they do not thrive much immediately after quitting the breast; they then yield scarce above twenty or twenty-four barrels of blubber: from that time forward they are called *skull-fish*, and their age is wholly unknown.

Every species of whale propagates only with those of its own kind, and does not at all mingle with the rest: however, they are generally seen in shoals of different kinds together, and make their migrations in large companies from one ocean to another. They are a gregarious animal, which implies their want of mutual defence against the invasions of smaller, but more powerful fishes.

They cannot swallow large fishes, as their throat is so narrow that an animal larger than a herring could not enter. How then do they subsist and grow so fat? A small insect which is seen floating in those seas, and which Linnæus terms the *Medusa*, is sufficient for this supply. These

insects are black, and of the size of a small bean, and are sometimes seen floating in clusters on the surface of the water. They are round, like snails in a box; but they have wings, which are so tender that it is scarce possible to touch them without breaking. These serve rather for swimming than flying; and the little animal is called by the Icelanders the *Walsfichoas*, which signifies the whale's provender. They have the taste of raw mussels, and have the smell of burnt fugar. These are the food of the whale, which it is seen to draw up in great numbers with its huge jaws, and to bruise between its barbs, which are always found with several of these sticking among them.

As the whale is an inoffensive animal, it is not to be wondered that it has many enemies, willing to take advantage of its disposition, and inaptitude for combat. There is a small animal, of the shell-fish kind, called the *Whale-louse*, that sticks to its body, and insinuates itself chiefly under the fins; and whatever efforts the great animal makes, it still keeps its hold, and lives upon the fat. The *saw-fish*, however, is the whale's most terrible enemy. At the sight of this animal, says Anderson, the whale seems agitated in an extraordinary manner; leaping from the water as if with affright: wherever it appears, the whale perceives it at a distance, and flies from it. "I have been myself," continues he, "a spectator of their terrible encounter. The whale has no instrument of defence except the tail; with that it endeavours to strike the enemy; and a single blow taking place, would effectually destroy its adversary: but the saw-fish is as active as the other is strong, and easily avoids the stroke; then bounding into the air, it falls upon its great subjacent enemy, and endeavours, not to pierce with its pointed beak, but to cut with its toothed edges. The sea all about is soon dyed with blood, proceeding from the wounds of the whale; while the enormous animal vainly endeavours to reach its invader, and strikes with its tail against the surface of the water, making a report at each blow louder than the noise of a cannon."

There is still another and more powerful enemy, called, by the fishermen of New England, the *Killer*. This is itself a cetaceous animal, armed with strong and powerful teeth. A number of these are said to surround the whale, in the same manner as dogs get round a bull. Some attack it with their teeth behind; others attempt it before; until, at last, the great animal is torn down, and its tongue is said to be the only part they devour when they have made it their prey. They are said to be of such great strength, that one of them alone was known to stop a dead whale that

The Saw-fish

that several boats were towing along, and drag it from among them to the bottom.

But of all the enemies of these enormous fishes, man is the greatest: he alone destroys more in a year than the rest in an age, and actually has thinned their numbers in that part of the world where they are chiefly fought. The European ships, soon after the improvement of navigation, found the way into those seas; and as early as the beginning of the fourteenth century, the Biscayners were in possession of a very considerable trade to the coast of Greenland. The Dutch and the English followed them thither, and soon took that branch of commerce out of their hands. At present, the quantity of fish are so greatly reduced, by constant capture for such a vast length of time, that we cross the line, and voyage to the South Pole, for what we used to find in the North.

When arrived at the part where the whales are expected, the ships always keep their sails set; and a sailor is placed at the mast-head, to give information when he spies a whale. As soon as he discovers one, the whole crew are instantly in employment: they fit out their boats, and row to where the whale was seen. The harpooner, who is to strike the fish, stands at the prow of the boat, with an harpoon or javelin in his hand, five or six feet long, pointed with steel like the barb of an arrow, of a triangular shape. As this person's place is that of the greatest dexterity, so also it is of the greatest danger: the whale sometimes overturns the boat with a blow of its tail, and sometimes drives against it with fury. In general, however, the animal seems to sleep on the surface of the water; while the boat approaching, the harpooner stands aloft, and, with his harpoon tied to a cord of several hundred fathom length, darts it into the animal, and then rows as fast as possible away. It is some time before the whale seems to feel the blow; the instrument has usually pierced no deeper than the fat; and, that being insensible, the animal continues for a while motionless: but soon roused from its seeming lethargy, as the shaft continues to pierce deeper and deeper into the muscular flesh, it flies off with amazing rapidity. In the mean time, the harpoon sticks in its side; while the rope, which is coiled up in the boat, and runs upon a swivel, lengthens as the whale recedes, but still shews the part of the deep to which it has retreated. This cord is coiled with great care: for such is the rapidity with which it runs off, that if it was but the least checked, as it follows the animal's retreat, it would infallibly upset the boat, and the crew would go to the bottom. It sometimes happens also, that the rapidity with which it runs over the swivel at the edge of the boat, heats it, and it would

would certainly take fire, did not a man stand continually with a wet mop in his hand, to cool the swivel as the cord runs. The whale having dived to a considerable depth, remains at the bottom, sometimes for near half an hour, with the harpoon in its belly; and then rises to take breath, supposing the danger over: but the instant it appears, they are all with their boats ready to receive it, and sling their harpoons into its body: the animal again dives and again rises, while they repeat their blows. The ship follows in full sail, like all the rest, never losing sight of the boats, and ready to lend them assistance; the whole ocean seems dyed in blood. Thus they renew their attack, till the whale begins to be quite enfeebled and spent; when they plunge their longer spears into various parts of its body, and the enormous animal expires. When it is dead, to prevent it from sinking, they tie it with a strong iron chain to the side of the boat; and either cut it up in pieces, and carry it home in that manner; or extract the oil from the blubber on ship-board.

THE NARWHAL.

FROM whales that entirely want teeth, we come to one that has them in the upper jaw only; the Narwhal or Sea-unicorn. Not so large as the whale, about sixty feet long. Slenderer than the whale, and not so fat. Distinguished by its tooth or teeth, which stand pointing directly forward from the upper jaw, from nine to fourteen feet long. This terrible weapon is generally single; but there is the skull of a Narwhal at the Stadthouse at Amsterdam with two. It is as straight as an arrow, about the thickness of the small of a man's leg, wreathed, tapering to a sharp point; and is whiter, heavier, and harder than ivory. Its root enters into the socket above a foot and a half. When the animal possessed of these formidable weapons is urged to employ them, it drives directly forward against the enemy with its teeth, that, like protended spears, pierce whatever stands before them. Both sexes are found armed in this manner; the horn is sometimes wreathed, and sometimes smooth; sometimes a little bent, and sometimes straight; but always strong, deeply fixed, and sharp-pointed. Yet the narwhal is one of the most harmless and peaceful inhabitants of the ocean. Constantly and inoffensively sporting

The Cachalot, *or*, Sperma-ceti Whale.

sporting among the other great monsters of the deep, no way attempting to injure them, but pleased in their company. Wherever it is seen, the whale is shortly after sure to follow. This may arise as well from the natural passion for society in these animals, as from both living upon the same food, the insects above described.

The Narwhal has a much narrower gape than the Great Whale; and therefore does not want the use of barbs to keep in its food when once sucked into the mouth. It is also much swifter, and would never be taken but for those very tusks, which at first appear to be its principal defence. These animals, as was said, being fond of living together, are always seen in herds of several at a time; and whenever they are attacked, they crowd together in such a manner, that they are mutually embarrassed by their tusks. By these they are often locked together, and are prevented from sinking to the bottom. It seldom happens, therefore, but the fishermen make sure of one or two of the hindmost, which very well reward their trouble.

THE CACHALOT.

THE Cachalot, often called the *Spermaceti Whale*, has several teeth in the under jaw, but none in the upper. There are seven distinctions in this tribe. The Cachalot with two fins and a black back; that with two fins, and a whitish back; that with a spout in the neck; that with a spout in the snout; that with three fins and sharp-pointed teeth; that with three fins and sharp-edged teeth; and, lastly, the Cachalot with three fins and flatted teeth.

This tribe is not above sixty feet long, and sixteen feet high; more slender, and much more active, than the Whale; they remain a longer time at the bottom, and afford a smaller quantity of oil. The head is so large as to make one half of the whole. The tongue is small: but the throat very formidable; and with very great ease it could swallow an ox. In its stomach are found loads of fish of different kinds; some whole, some half digested, some eight or nine feet long; for the Cachalot can, at one gulp swallow a shoal of fishes.

enormous gullet. Linnæus tells us that this fish pursues and terrifies dolphins and porpoisses so much, as often to drive them on shore.

It furnishes two very precious drugs; spermaceti, and, some say, ambergrise. The capture of this animal, that alone supplies them, therefore turns out very advantageous, particularly since the art has been found out of converting all the oil of this animal, as well as the brain, into that substance called spermaceti. This substance is found in the head of the animal, and is the brain. The outward skin of the head being taken off, a covering of fat offers, about three inches thick; and under that, instead of a bony skull, the animal has only another thick skin, that serves for a covering and defence of the brain. The first cavity, or chamber, of the brain, is filled with that spermaceti which is supposed of the greatest purity and highest value. From this cavity there are generally drawn about seven barrels of the clearest spermaceti; that thrown upon water coagulates like cheese. Below this there is another chamber just over the gullet, which is about seven feet high; and this also contains the drug, but of less value. It is distributed in this cavity like honey in a hive, in small cells, separated from each other by a membrane like the inner skin of an egg. In proportion as the oily substance is drawn away from this part, it fills anew from every part of the body: and from this is generally obtained about nine barrels of oil. Besides this, the spinal marrow, which is about as thick as a man's thigh, and reaches all along the back-bone to the tail, where it is not thicker than one's finger, affords no inconsiderable quantity.

Ambergrise, which is said to be sometimes found in this whale, was long considered as a substance found floating on the surface of the sea; but time has discovered that it chiefly belongs to this animal; is found in the place where the seminal vessels are usually situated in other animals, in a bag of three or four feet long, in round lumps, from one to twenty pounds weight, floating in a fluid rather thinner than oil, and of a yellowish colour. There are never seen more than four at a time in one of these bags; and that which weighed twenty pounds, and which was the largest ever seen, was found single. These balls are not found in all fishes of this kind, but chiefly in the oldest and strongest.

THE DOLPHIN, GRAMPUS, AND PORPESSE.

ALL these fish have teeth both in the upper and the lower jaw, and are much less than the whale.

The GRAMPUS exceeds twenty feet; is distinguished by the flatness of its head, which resembles a boat turned upside down.

The PORPESSE resembles the Grampus, except in being only half its length; its snout also more resembles that of an hog.

The DOLPHIN has a strong resemblance to the porpesse, but its snout is longer and more pointed.

They have all fins on the back; heads very large, like the rest of the whale kind; and resemble each other in appetites, manners, and conformation; equally voracious, active, and roving. All this tribe, and the dolphin in particular, are not less swift than destructive. No fish could escape them, but from the awkward position of the mouth, which is placed in a manner under the head; yet, even with these disadvantages, their depredations are so great, that they have been justly styled the plunderers of the deep. What could induce the ancients to a predilection in favour of the Dolphin, it is not easy to account for. The ancient painters and sculptors have universally drawn them wrong. A Dolphin is scarce ever exhibited by them straight, but curved, in the position which they sometimes appear in, when exerting their force out of their natural element.

They are found, the porpesse especially, in such vast numbers, in all parts of the sea that surrounds this kingdom, that they are sometimes noxious to seamen, when they sail in small vessels. In some places they almost darken the water as they rise to take breath; and particularly before bad weather are much agitated, swimming against the wind, and tumbling about with unusual violence. It is probable they dread those seasons of turbulence, when the lesser fishes shrink to the bottom, and their prey no longer offers in sufficient abundance. In fairer weather they herd together, pursuing shoals of various fish with great impetuosity. Their method of hunting their game, if it may be so called, is to follow in a pack, and give each other mutual assistance. At that season when the mackerel, the herring, the salmon, and other fish of passage, begin to make their appearance, the cetaceous tribes are seen fierce in the pursuit; urging their prey from one creek or bay to another, deterring them from the shallows, driving them towards each other's am-

bush, and using a greater variety of arts than hounds are seen to exert in pursuing the hare. However, the porpessè not only seeks for prey near the surface, but often descends to the bottom in search of sand-eels and sea-worms, which it roots out of the sand with its nose, in the manner hogs harrow up the fields for food. For this purpose, the nose projects a little, is shorter and stronger than that of the dolphin; and the neck is furnished with very strong muscles, which enable it the readier to turn up the sand.

They are often taken in the Thames at London, both above the bridges and below them. It is curious to observe with what activity they avoid their pursuers, and what little time they require to fetch breath above the water. The Porpessè yields a very large quantity of oil; and the lean of some, particularly if the animal be young, is said to be as well tasted as veal.

Go with young ten months; seldom bring above one at a time, and in the midst of summer: they live to a considerable age (though some say not above twenty-five or thirty years); and sleep with the snout above water. They seem to possess, in a degree proportioned to their bulk, the manners of whales.

OF CARTILAGINOUS FISHES.

THEIR first great distinction is, in having cartilages or gristles instead of bones. Age, that hardens the bones of other animals, rather contributes to soften theirs. The size of all fishes increases with age; but, from the pliancy of the bones in this tribe, they seem to have no bounds to their dimensions: and it is supposed that they grow larger till they die. Cartilaginous fishes, like the cetaceous tribes, have organs of hearing, and lungs; like the spinous kinds, they have gills, and a heart without a partition; thus possessing a two-fold power of breathing. This double capacity of breathing, is one of the most remarkable circumstances in the history of nature. The apertures by which they breathe, are placed about the head; either beneath, as in flat fish; on the sides, as in sharks; or on the top of the head, as in pipe-fish. To these apertures are the gills affixed, but without any bone to open and shut them, as in spinous fishes, from which they may be easily distinguished by this mark. From these are bending cylindrical ducts, that run to the lungs, and are supposed to convey the air that gives the organs their proper play.

From this structure, they are enabled to live longer out of water than those

Great Shark.

those whose gills are more simple, often several hours; or they can remain continually under water, without taking breath. Some bring forth their young alive; and some bring forth eggs. The young, while in the body, continue in the egg till a very little time before they are excluded: so that these eggs they may properly be said to hatch within the body. The eggs consist of a white and a yolk; and have a substance, instead of shell, that may be compared to softened horn.

Cartilaginous fishes may be divided, first into those of the shark kind, with a body growing less towards the tail, a rough skin, the mouth placed far beneath the end of the nose, five apertures on the sides of the neck for breathing, and the upper part of the tail longer than the lower.

The next division is that of flat fish; whose broad, flat, thin shape sufficiently distinguishes them. They may be easily known from spinous flat fish, by the holes through which they breathe, which are uncovered by a bone; and which, in this kind, are five on each side. In this tribe we may place the Torpedo, the Skate, the Sharp-nosed Ray, the Rough Ray, the Thornback, and the Fire Flare.

The third division is that of the slender snake-shaped kind; such as the Lamprey, the Pride, and the Pipe Fish.

The fourth division is of the Sturgeon and its variety, the Ising-glass Fish.

The last division may comprise fish of different figures and natures, that do not rank under the former divisions. These are the Sun Fish, the Tetrodon, the Lump Fish, the Sea Snail, the Chimera, and the Fishing Frog.

THE SHARK KIND,

OF all the inhabitants of the deep, the fiercest and the most voracious. The smallest of this tribe is dreaded even by great fish: but the Great White Shark, which is the largest, joins to the most amazing rapidity, the strongest appetites for mischief: he approaches nearly in size to the Whale, far surpasses him in strength and celerity, in the formidable arrangement of his teeth, and his insatiable voracity.

Is found from twenty to thirty feet long; some assert, to four thousand pound weight; and we are told of one, that had a human corpse entire in his belly. The head is large, somewhat flattened; snout long; eyes large: mouth enormously wide; the throat capable of swallowing a man with ease. Has sometimes six rows of teeth, extremely hard, sharp-pointed; and triangular, and finely serrated: some say seventy-two in each jaw, making one hundred and forty-four in all; others think that, as the animal grows older, they increase. With these both the jaws appear planted: the animal can erect or depress them at pleasure. When the shark is at rest, they lie flat in his mouth; but when he prepares to seize his prey, he erects them, by a set of muscles that join them to the jaw. His fins are large; his great goggle eyes he turns with ease on every side, to see his prey behind as well as before: his skin is rough, hard, and prickly. His colour light ash. Providentially the upper jaw projects so far above the lower, that he is obliged to turn on one side (not quite on his back, as is generally supposed) to seize his prey: As this takes some small time to perform, the animal pursued seizes that opportunity of escaping. It breathes with gills and lungs; its bones are gristly; and it is viviparous: Belon assures us, he once saw a female produce eleven young.

No fish can swim so fast; none is so constantly employed in swimming; he outstrips the swiftest ships, plays round them, darts out before them, and returns, seeming to gaze at the passengers, without any apparent effort. The dread of sailors in all hot climates; where he attends the ships, in expectation of what may drop over-board. A man who unfortunately falls into the sea at such a time, is sure to perish; for, when once it has tasted human flesh, it never desists from haunting those places where it expects such prey.

The usual method of our sailors to take him, is by baiting a great hook with a piece of beef or pork, which is thrown out into the sea by a strong cord, strengthened near the hook with an iron chain. Without this precaution, the shark would quickly bite the cord in two, and thus set himself free. It is no unpleasant amusement to observe this voracious animal coming up to survey the bait, particularly when not pressed by hunger. He approaches it, examines it, swims round it, seems for a time to neglect it, perhaps apprehensive of the cord and the chain; he quits it for a little; but his appetite pressing, he returns again; appears preparing to devour it, but quits it once more. When the sailors have sufficiently diverted themselves with his evolutions, they make a pretence,

by drawing the rope, as if intending to take it away : then his hunger excites him ; he darts at the bait, and swallows it, hook and all. Sometimes, however, he does not so entirely gorge the whole, but that he once more gets free ; yet even then, though wounded and bleeding with the hook, he will again pursue the bait until he is taken. When he finds the hook lodged in his maw, his utmost efforts are excited, but in vain, to get free : he tries with his teeth to cut the chain ; he pulls with all his force to break the line ; he almost seems to turn his stomach inside out to disgorge the hook ; in this manner he continues his formidable, though fruitless efforts ; till quite spent, he suffers his head to be drawn above water, and the sailors, confining his tail by a nooze, in this manner draw him on ship board, and dispatch him. This is done by beating him on the head till he dies ; yet even that is not effected without difficulty and danger ; the enormous creature, terrible even in the agonies of death, still struggles with his destroyers ; nor is there an animal in the world that is harder to be killed. Even when cut in pieces, the muscles still preserve their motion, and vibrate for some minutes after being separated from the body. Instantly as he is taken up, to prevent his flouncing, they cut off the tail with an axe.

Some of the negroes on the African coast, take a bolder and more dangerous method to combat their terrible enemy. Armed with only a knife, the negro plunges into the water, where he sees the Shark watching, and swims forward to meet him ; though the great animal does not come to provoke the combat, he does not avoid it, and suffers the man to approach him ; but just as he turns upon his side to seize the aggressor, the negro watches the opportunity, plunges his knife in the fish's belly, and pursues his blows with such success that he lays the ravenous tyrant dead : he soon however returns, fixes the fish's head in a nooze, and drags him to shore, where he makes a noble feast for the adjacent villages.

The flesh is hardly digestible by any but the negroes, who are fond of it ; the liver affords three or four quarts of oil ; some imaginary virtues have been ascribed to the brain ; and its skin is, by great labour, polished into that substance called shagreen. Mr. Pennant is of opinion, that the female is larger than the male in all this tribe ; which would, if confirmed by experience, make a striking agreement between them and birds of prey.

There are many kinds : as the Blue Shark ; Angel Shark, which approaches in form to a Ray ; Basking Shark which is fond of warm and sunny waters, and is said not to be voracious, but to feed on plants, &c. ; the Long-tailed Shark, or Sea Fox ; the Spotted Shark ; and many others.

Among the most remarkable by its form, is the *Hammer-headed Shark*; whose head extends sideways into two great flaps, at the extremities of which are the eyes, large, round, and projecting; its mouth under its head; its teeth strong, sharp, and three or four rows; breathing holes on the sides. By this peculiarity of head, it is distinguished from all other fish.

The *Remora*, or *Sucking Fish*, is said to follow the Shark every where. This fish has a power of adhering to whatever it sticks against, as a cupping-glass sticks to the human body. Thus this animal sticks to the Shark, and drains away its moisture.

THE RAY KIND.

ALL fish of the Ray kind are broad, cartilaginous, swimming flat on the water, and having spines on their body, or tail. Their eyes and mouth are placed quite under the body, with apertures for breathing either about or near them. All have teeth, or a rough bone which answers the same purpose. Their bowels are very wide towards the mouth; diminishing to the tail. The tail is narrow, ending either in a bunch or a point. But they are chiefly distinguished by their spines or prickles, on different parts of their body. Some have spines above and below; others on the upper part only; some at the tail; some have three rows, others but one: in some they are comparatively soft and feeble; in others, strong and piercing. The smallest of these spines usually incline toward the tail, the larger toward the head.

The *Skate* has the middle of the back rough, and a single row of spines on the tail, on the edges a few others. The *Sharp-nosed Ray* has ten spines situated toward the middle of the back. The *Rough Ray* has spines over the whole back. The *Thornback* has three rows on the back, and more on the tail. The *Fire-flare* has but one spine, but that a dangerous weapon, placed on the tail, about four inches from the body, five inches long; of a flinty hardness, the sides thin, sharp-pointed, closely and sharply bearded its whole length. The *Torpedo* has no spines that wound; but is possessed of one of the most potent and extraordinary faculties in nature, viz. that of electrifying whatever it touches.

Of the larger fish these are the most numerous. Except the white shark and cachalot no fish can swallow them, and their spines make them dangerous; the size of some is such, that even the shark himself is unable to devour

Hammer-headed Shark.

The Ray

The Torpedo

devour them: some have been seen in England weighing two hundred pounds; but that is nothing to their enormous bulk in other parts of the world. Labat tells us of a prodigious Ray speared by the negroes at Gaudaloupe, thirteen feet eight inches broad, ten feet from the snout to the insertion of the tail. The tail itself fifteen feet long; twenty inches broad at its insertion, and tapering to a point. The body two feet in depth; the skin as thick as leather, and spotted; which spots, in all of this kind, are only glands, that supply a mucus to lubricate and soften the skin. This enormous fish was utterly unfit to be eaten by the Europeans; but the negroes chose out some of the nicest bits, and carefully salted them up as a most favourite provision. Ulloa gives the same account of a fish in the South Seas, called the *Manta* or *Quilt*, from its wrapping the divers to death in its fins; for fear of which they always carry a knife with them when they go down. Yet, large as this may seem, it is probable that, as the largest generally keep at the bottom, they are seldom or never seen. It is generally supposed that of this kind are the largest inhabitants of the deep.

The Ray generally chuses a black muddy bottom; the large ones keep at great depths; the smaller approach the shores, and feed on whatever they can meet with. As they are ravenous, they easily take the bait, yet will not touch it if it be taken up and kept a day or two out of water. Generate in March and April; at which time only they are seen swimming near the surface. They adhere fast together: the females are very prolific, three hundred eggs having been taken out of the body of a single Ray. These are covered with a tough horny substance, which they acquire in the womb. When come to proper maturity, they are excluded, but never above one or two at a time, and often at intervals of three or four hours; they begin in May. In October, when they cease, they are exceedingly thin; in November they begin to improve, and grow gradually better till May, when they are in the highest perfection.

The Skate and the Thornback are very good food; and their size, which is from ten pounds to two hundred weight, very well rewards the trouble of fishing for them. But it sometimes happens that the lines are visited by very unwelcome intruders; by the rough ray, the firefiare, or the torpedo. To these the fishermen have most mortal antipathy; and shudder at the sight; for they sometimes feel the resentments of this angry tribe; and, instead of a prize, find they have caught an enemy.

The Rough ray inflicts but slight wounds with its prickles. The ignorant would at first sight take it in his hand, without apprehension;

but he soon finds that there is no part of its body without spines; and no way of seizing the animal; but by the little fin at the end of the tail.

The Fireflare is dreaded by the boldest and most experienced fishermen; inflicting a terrible wound, attended with dangerous symptoms; but it cannot be poisonous, as the spine has no sheath to preserve the supposed venom on its surface; nor has the animal a gland to separate the noxious fluid; the spine is fixed to the tail, as a quill to the tail of a fowl, and is annually shed in the same manner.

The body of the Torpedo is almost circular, and thicker than others of the ray kind; the skin is soft, smooth, yellowish, marked, as all the kind, with large annular spots; the eyes very small; the tail tapering to a point; weighs from seven to fifteen pounds. Redi found one of twenty-four pounds.

The shock of this fish proceeds from an animal electricity, which it has a power of storing up, and discharging. The shocks, and duration of the pain, are like the electric: but how the animal contrives to renew the charge, how it is prevented from evaporating it on contiguous objects, how it is originally procured, are difficulties. As its strength ceases, the force of its shock diminishes, and when dead is destroyed; it may be handled or eaten with perfect security: when immediately taken out of the sea, its force is very great, and not only affects the hand, but, if even touched with a stick, the person finds himself sometimes affected. It appears that the Torpedo has an apparatus under the skin, entirely for this purpose; which, like the electric battery, is an assemblage of strength, formed from various smaller powers: these, discharged at once, give an exceeding smart shock: while earth and water, as well as air, are replete with the electric fluid, we may consider them as furnishing those stores which this creature, by its extraordinary qualities, has the power of *conducting*. The uses of this power seem to be, *first*, the numbing its enemies when they attempt to seize it; *secondly*, numbing its prey, as it passes over. It is frequent in Torbay. Brings forth its young in September. Seems to be capable of superfoetation. The Crab and Sea-Leech annoy them. Some weigh eighty pounds. Godignus, in his History of Abyssinia, carries this quality to a most ridiculous excess: he tells us of one of these that was put into a basket among a number of dead fishes and that the next morning the people, to their utter astonishment, perceived that the Torpedo had actually *numbed* the dead fishes *into life again*.

There are other fish possessed of this numbing quality, which has acquired them the name of the Torpedo. These are described by Atkins and Moore, as found in great abundance along the coast of Africa. They

are shaped like a mackarel; except that the head is much larger; the effects of these seem also to differ in some respects. Condamine also informs us of a fish possessing these powers, resembling the Lamprey (the *Gymnotus Electricus*). This, if touched by the hand, or with a stick, instantly benumbs the hand and arm to the very shoulder; and sometimes the man falls down under the blow. Inhabits America.

THE LAMPREY.

THE Lamprey is esteemed according to the season, or the place where it has fed. Those that leave the sea to deposit their spawn in fresh waters, are the best; those entirely bred in our rivers, are much inferior. In March, April, or May, just after leaving the sea, they are very good; those caught after they have cast their spawn, are flabby and of little value. Those caught in several of the rivers in Ireland, the people will not venture to touch; those of the English Severn are considered as the most delicate of fish.

The Lamprey resembles an eel in general appearance, but is of a lighter colour, and clumsier make. Its mouth is round, placed rather obliquely below the end of the nose, more resembling the mouth of a leech than of an eel: on the top of the head a hole through which it spouts water, as in the cetaceous kind; seven holes on each side for respiration; the fins are formed rather by a lengthening out the skin, than by a set of bones or spines for that purpose. The mouth has a property of sticking close to, and sucking, any body it is applied to. We are told of one that weighed but three pounds; yet stuck so firmly to a stone of twelve pounds, that it remained suspended at its mouth, from which it was separated with no small difficulty. This power of suction is supposed to arise from the animal's exhausting the air within its body by the hole over the nose, while the mouth is closely fixed to the object, and permits no air to enter; has twenty rows of small teeth in its mouth. Its adhesive quality may be in some measure increased by that slimy substance with which its body is all over smeared.

From some peculiarity of formation, this animal swims generally with its body as near as possible to the surface; and it might easily be drowned
by

by being kept by force for any time under water; it seems to have but one great bowel, running from the mouth to the vent, narrow at both ends, and wide in the middle. The Lamprey's food is either slime and water, or such small water-insects as are scarce perceivable. Perhaps its appetite may be more active at sea, of which it is properly a native.

It quits the sea in the beginning of spring, in order to spawn, and after a stay of a few months it returns again to the sea. Their preparation for spawning is by making holes in the gravelly bottom of rivers; and on this occasion their sucking power is particularly serviceable; for if they meet with a stone of a considerable size, they will remove it, and throw it out. Their young are produced from eggs; the female remains near the place where they are excluded, and continues with them till they come forth. She is sometimes seen with her whole family playing about her; and after some time she conducts them in triumph to the ocean. But some have not sufficient strength to return; and these continue in the fresh water till they die. This fish, according to Rondeletius, is very short-lived, and two years is generally the limit of its existence.

They are usually taken in nets with salmon, and sometimes in baskets at the bottom of the river. It has been an old custom for the city of Gloucester annually to present the king with a lamprey-pie; and as the gift is made at Christmas, it is not without great difficulty the corporation can procure the proper quantity, though they give a guinea apiece for taking them. There are two or three sizes, rather than sorts; that called the Pride of the Isis, is not peculiar to that river,

THE STURGEON.

THE Sturgeon in its general form resembles a fresh-water pike. The nose is long; the mouth is situated beneath, small, and without jaw-bones; always open in the dead fish. The body is long, pentagonal, flat below, and covered with five rows of large bony knobs, one row on the back, and two on each side; on the back a single fin near the tail; which is bifurcated. Five other fins below.

Of this fish there are three kinds; the Common Sturgeon, the Caviar Sturgeon, and the Huso or Isinglass Fish. The first has eleven knobs or

scales on the back; the second fifteen; the latter thirteen on the back and forty-three on the tail. The first is the Sturgeon, the flesh of which is sent pickled into all parts of Europe. The second is the fish from the roe of which that noted delicacy called caviar is made: and the third, besides supplying the caviar, furnishes also the valuable commodity of isinglass. They all grow to a very great size; and some of them have been found above eighteen feet long.

There is not a country in Europe but what this fish visits at different seasons; it annually ascends the largest rivers to *spawn*, and propagates in amazing numbers. The inhabitants along the banks of the Po, the Danube, and the Wolga, make great profit of its incursions up the stream, and have their nets prepared for its reception. The sturgeon also is brought daily to the markets of Rome and Venice, and abounds in the Mediterranean; those that keep entirely either in salt or fresh water are comparatively small. When the sturgeon enjoys the vicissitude of fresh and salt water, it grows to an enormous size. It is often accidentally taken in our rivers in salmon-nets: a fish taken in the Eske weighed four hundred and sixty pounds. North-America also furnishes the sturgeon; their rivers, in May, June, and July, supply them in very great abundance. At that time they are seen sporting in the water, and leaping from its surface several yards into the air. When they fall again on their sides, the concussion is so violent, that the noise is heard in still weather at some miles distance.

It is never caught by a bait in the ordinary manner of fishing, but always in nets; it never attempts to seize any of the finny tribe, but lives by rooting at the bottom of the sea for insects and sea-plants. Nothing is found in its stomach but a kind of slimy substance, which has induced some to think it lives only upon water and air. From hence there is a German proverb, which is applied to a man extremely temperate, when they say he is as moderate as a sturgeon.

The smallest fish is alone sufficient to terrify a shoal of sturgeons; for, being unfurnished with any weapon of defence, they are obliged to trust to swiftness and caution for security. Sturgeons live in society among themselves; Gesner asserts, that he has seen them shoal together, at the notes of a trumpet.

The nets in which the sturgeon is caught are made of small cord, and placed across the mouth of the river; but in such a manner that, whether the tide ebbs or flows, the pouch of the net goes with the stream. The sturgeon thus caught, while in the water, is one of the strongest fishes that

swims, and often breaks the net to pieces that encloses it; but the instant it is raised with its head above water, all its activity ceases: it is then a lifeless, spiritless lump, and suffers itself to be tamely dragged on shore; yet it has been found to break a fisherman's leg with a blow of its tail.

Caviar is made from the roe of all kinds of sturgeon, but particularly the second. It is a considerable merchandize among the Turks, Greeks, and Venetians. Caviar somewhat resembles soft soap in consistence; but it is of a brown, uniform colour, and is eaten as cheese with bread. It is made of the spawn from the body of the sturgeon; for the sturgeon differs from other cartilaginous fish, having spawn like a cod, not eggs like a ray.

The Huso, or Isinglass Fish, is caught in great quantities in the Danube, from the months of October to January: seldom under fifty pounds weight, often above four hundred: its flesh is soft, glutinous and flabby; but it is sometimes salted, which makes it better tasted, and then it turns red like salmon. It is for the commodity it furnishes that it is chiefly taken. Isinglass is of a whitish substance, inclining to yellow, done up into rolls, made of the skin, the entrails, the fins and the tail of this fish, cut into small pieces, macerated and boiled to a jelly; which hardens when dry.

OF ANOMALOUS CARTILAGINOUS FISHES.

IN this class we have the Pipe Fish, that almost tapers to a thread; the Mole, or Sun Fish, that has the appearance of a bulky head, but the body cut off in the middle; the Hippocampus, with an head somewhat like that of an horse; and the Water Bat, whose head can scarcely be distinguished from the body; the Fishing Frog, from its deformity, called the Sea Devil, the Chimæra, the Lump Fish, the Sea Porcupine, and the Sea Snail. Of these the history is but little known.

The Mole, or Sun Fish, sometimes grows very large; one taken near Plymouth was five hundred weight. In form it resembles a bream, or some deep fish cut off in the middle: the mouth is very small, and contains in each jaw two broad teeth, with sharp edges: the colour of the back is dusky and dappled, the belly a silvery white. When boiled, it has been observed to turn to a glutinous jelly, and would most probably serve

The Orb.

The Mole.

The Globe Mole, *or* Diodon

serve for all the purposes of isinglass, were it found in sufficient plenty. Of this there is a shorter and a longer. The Globe Mole, or *Diodon*, is remarkable for the power of inflating its belly, which is usually oblong, to a very great size and globular shape, thereby erecting the spines with which that part is covered so as to render it less seizable, and more terrific to fish of prey. Circumference of one in this condition, two feet six, length of the belly one foot, whole length one foot seven inches, belly and sides white, wrinkled. Common to Europe and Carolina.

The Fishing Frog in shape generally resembles a tadpole; but it grows to above five feet long, and its mouth is sometimes a yard wide. The head is much bigger than the body; the under jaw projects before the upper; both are armed with rows of slender, sharp teeth: the palate and tongue have also teeth; the eyes are on the top of the head, encompassed with prickles: immediately above the nose are two long beards or filaments, small in the beginning, but thicker at the end, and round. There is another species that has no beards. *Rondeletius* informs us, that, when embowelled, the body has a kind of transparence; and, if a lighted candle be placed within it, as in a lanthorn, has a very formidable appearance. It is an enemy to the dog-fish, the bodies of those fierce and voracious animals being often found in its stomach.

The Lump Fish is in length sixteen or twenty inches, weighs about four pounds; shape deep; it swims edgeways; the back is sharp and elevated, and the belly flat; the lips, mouth and tongue a deep red; the whole skin is rough, with bony knobs; the largest row is along the ridge of the back; the belly a bright crimson: but what makes the chief singularity in this fish, is an oval aperture in the belly, surrounded with a fleshy soft substance, that seems bearded all round; by means of this part, it adheres with vast force to any thing it pleases. If flung into a pail of water, it will stick so close to the bottom, that, on taking the fish by the tail, one may lift up pail and all, though it hold several gallons of water.

The Sea Snail takes its name from the soft and unctuous texture of its body, resembling a land snail. It is almost transparent, and soon dissolves and melts away. It is five inches long; colour, when fresh taken, pale brown; shape round, but flattened near the tail; the back-fin reaches all the way from the head to the tail. Beneath the throat is a round depression, of a whitish colour, surrounded by twelve brown risings, placed in a circle, by which it is thought to be also a sucker. It is taken in England, at the mouths of rivers, four or five miles distant from the sea. There are other suckers of much smaller dimensions.

The Pipe Fish, in the thickest part, is not thicker than a swan-quill, yet is above sixteen inches long; hexangular in part, the tail quadrangular. General colour olive brown, marked with numbers of blueish lines, pointing from the back to the belly. Is viviparous; for, on crushing one that was just taken, hundreds of very minute young ones were observed to crawl about. There are others less, and not viviparous.

The Hippocampus, which, from the form of its head, some call the Sea Horse, never exceeds nine inches in length. It is about as thick as a man's thumb; and the body is said, while alive, to have hair on the fore part, which falls off when it is dead. The snout is a sort of tube, with a hole at the bottom, to which there is a cover, which the animal can open and shut at pleasure. Behind the eyes are two fins, which look like ears; and above them are two holes, which serve for respiration. The whole body seems to be composed of cartilaginous rings, on the intermediate membranes of which several small prickles are placed. It is found in the Mediterranean, and also in the Western Ocean; and, upon the whole, more resembles a great caterpillar than a fish. The ancients considered it as extremely venomous.

Among foreign animals of this kind, chiefly Indian and American, we may place the Sea Orb, which is almost round, has a mouth like a frog, and is, from seven inches to two feet long. Like the porcupine, from whence it sometimes takes its name, being also called the Sea Porcupine, covered over with long thorns or prickles, which point on every side; and, when the animal is enraged, it can blow up its body as round as a bladder. Of this extraordinary creature there are many kinds; some threatening only with spines, as the Sea Hedge-hog; others defended with a bony helmet that covers the head, as the Ostracion; others with a coat of mail from the head to the tail, where it terminates in a point, as the Centriscus; and others still armed offensively and defensively with bones and spines, as the Shield Orb. Of these scarce one is without its peculiar weapon of offence. The centriscus wounds with its spine; the ostracion poisons with its venom; the orb is impregnable, and is absolutely poisonous, if eaten.

They are of different sizes; some not bigger than a foot-ball, and others as large as a bushel. They almost all flatten and erect their spines at pleasure, and increase the terrors of their appearance in proportion to the approach of danger. At first they seem inoffensive; their body oblong, with all their weapons pointing towards the tail; but upon

The Sea Hedghog.

being provoked or alarmed, the body that before seemed small swells rounder and larger, all its prickles stand upright, and threaten the invader on every side. In the middle of the belly is a sort of bag or bladder filled with air, by inflation of which the animal swells itself.

The Galley (which Linnæus degrades among insects, under the title *Medusa*), to the eye of an unmindful spectator, seems a transparent bubble swimming on the sea, variously and beautifully painted with vivid colours, where red and violet predominate, as differently opposed to the sun's rays. It is however a fish; its body composed of cartilages, and a very thin skin filled with air, which keeps it floating. Sometimes it is thrown ashore by one wave, and washed back by another. Persons walking along the shore often tread on these animals; and the bursting of their body has a report like that of the air bladder of a fish. It has eight broad feet; it fastens itself to whatever it meets by its legs, which have an adhesive quality. Whether they move when on shore Labat could never perceive, though he did every thing to make them stir; he only saw that it strongly adhered to whatever substances he applied it. It is common in America, the size of a goose-egg, or somewhat more. Perpetually floats, and no efforts can sink it. Beneath, in the water, are four feet serving as oars, the other four are expanded above to sail with. But what is remarkable is the violent pungency of the slimy substance with which its legs are smeared. If the smallest quantity but touch the skin, it burns it like hot oil dropped on the part. The pain is worst in the heat of the day, but ceases in the cool of the evening. From feeding on these he thinks the poisonous quality of some West-Indian fish may be accounted for. They are extremely common along all the coasts in the Gulf of Mexico; and whenever the shore is covered with them in an unusual manner, it is considered as a certain forerunner of a storm.

OF SPINOUS FISHES.

THESE are distinguished by having a complete bony covering to their gills; by breathing with gills only; by their bones being sharp and thorny; and their tails being placed perpendicular to the body. The foregoing classes bear no proportion to them in number.

Of

Of the real history of these fishes, very little is known; our information relates only to their external form.

Fish that have bony prickly fins, are called Prickly-finned Fish; those that have soft or cartilaginous fins, are called Soft-finned Fish. Spinous fish therefore are formed into these two divisions.

Linnæus has also arranged them by remarking the situation of their fins: the ventral or belly fins (which are those particularly to be remarked) are (1) either wholly *wanting*, as in the eel; then the fish is called *Apodal* (a Greek word signifying without feet); or (2) the ventral fins are placed *forwarder* than the pectoral fins, as in the haddock; then the animal is called a *Jugular* fish; or (3) the ventral fins are placed *directly under* the pectoral fins, as in the father-lasher; then it is called a *Thoracic* fish; or (4) the ventral fins are placed *nearer the tail* than the pectoral fins, as in the minnow; then it is an *Abdominal* fish.

Prickly-finned fish making one general division, and the soft-finned fish another, there are prickly-finned *apodal* fishes, prickly finned *jugular* fishes, prickly-finned *thoracic* fishes, and prickly-finned *abdominal* fishes: also, on the other hand, there are soft-finned *apodal* fishes, soft-finned *jugular* fishes, soft-finned *thoracic* fishes, and soft-finned *abdominal* fishes.

OF SPINOUS FISHES IN GENERAL.

THE history of any one of this class very much resembles that of the rest: they breathe air and water through the gills; they live by rapine, each devouring such animals as it can swallow; and they propagate, not by bringing forth their young alive, as in the cetaceous tribe; nor by distinct eggs, as in the generality of the cartilaginous tribe; but by spawn, which contains hundreds of thousands. Their bones when slightly inspected appear entirely solid; yet, viewed closely, are hollow, filled with a substance less rancid and oily than marrow. They are very numerous, and pointed. The skeleton of a fish has its members very regularly disposed; and every bone its fixed place, with perfect precision. Their number of bones is according to their number of fins; and the number in each fin is in proportion to the number and size of the fins: for every fish has a regular apparatus of bones and muscles, by which the

fins

fins are moved ; those fish which are large, fat, and have few fins, are the least bony : those which are small, lean, and have many fins, are the most bony.

Spinous fish can live out of their own element but a very short time. In general, when taken out of the water, they pant violently and at close intervals, the thin air not maintaining their gills in proper play ; and in a few minutes they expire. But some are more vivacious than others ; the eel lives several hours out of water ; and the carp has been fattened in a damp cellar ; being placed in a net well wrapped up in wet moss, the mouth only out, and hung up in a vault ; fed with white bread and milk ; and the net now and then plunged into the water. Thus managed, it has been known not only to live a fortnight, but to grow exceeding fat, and of superior flavour. To some fishes, bred in the sea, fresh water is immediate destruction : on the other hand, some fishes, that live in our lakes and ponds, cannot bear salt water. Probably this arises from the superior weight of the sea water, and its greater force on the organs of respiration ; so that fish used only to fresh water, cannot bear the weight of the marine fluid. No fishes imbibe any of the sea's saltiness with their food, or in respiration. The flesh of all fishes is equally fresh, both in the river, and at the saltiest depths of the ocean ; yet there are some whose organs are equally adapted to either element : the salmon, the shad, the smelt, and the flounder, annually quit their native ocean, and come up our rivers to deposite their spawn. There is no danger they will not encounter, even to the surmounting precipices, to find a proper place for depositing their future offspring. The SALMON ascend rivers five hundred miles from the sea ; braving not only the danger of enemies, but also the ascent of cataracts as high as a house. When they come to the bottom of such a torrent, they seem disappointed at the obstruction, and swim some paces back : then view the danger before them, survey it motionless for some minutes, advance, and again retreat ; at last summoning all their force, they leap from below, their body straight, and strongly in motion ; and thus most frequently clear every obstruction. But sometimes they want strength to make the leap ; and then, in our fisheries, they are taken in their descent, also by the hook, by nets, baskets, &c. Their capture makes, in several countries, a great article of commerce ; being cured in several different manners, by salting, pickling, or drying.

Others, particularly the EEL, descend from fresh water, as Redi assures us, to bring forth in the sea. About August, annually, in the most obscure nights, and when the rivers are flooded by rains, they seek the ocean.

Having reached the sea, and produced their young (for these are viviparous), they again ascend, as opportunity offers, from January to May, when they are taken in the river Arno by millions, and so small that a thousand of them goes to a pound. It is certain they descend in our own rivers after floods, in abundance, and are caught in nets, to great advantage. They possess also a power of climbing over obstacles; for, by applying their glutinous and slimy bodies, they can creep up locks, weirs, and every thing that would prevent their ascending the stream.

There are fish that take a course of three or four thousand miles in a season; yet preyed on by whales, sharks, and water-fowl, that regularly wait their progress. These fish of passage bear strong analogy to birds of passage, both from their social disposition, and their immense numbers. Such are the cod, the haddock, the whiting, the mackarel, the tunny, the herring, and the pilchard. Other fish live in our vicinity, and reside on our coasts; or keep in the depths of ocean, seldom seen: but these, at stated seasons, visit their accustomed haunts with regular certainty, generally returning the same week in the succeeding year, and often the same day.

This is one of the most extraordinary circumstances in the history of nature. What impels them to such voyages; what directs their passage; what supports them by the way; and what sometimes prompts them to quit, for several seasons, one shore for another, and then return to their accustomed harbour; are questions philosophy can hardly resolve.

The COD seems foremost of this wandering tribe; is only found in our northern part of the world. Its chief resort is on the banks of Newfoundland, and the other sand-banks off Cape-Breton. That extensive flat seems to be the broad top of a sea-mountain, extending above five hundred miles, and surrounded with a deeper sea. Hither the cod annually repair in numbers beyond calculation, to feed on the worms found in that sandy bottom. Here they are taken in quantities, to supply all Europe. Yet this immense capture makes but a very small diminution of their numbers. When their provision there is exhausted, or the season for propagation returns, they go off to the polar seas, where they deposit their roes in security. From thence want of food forces them, as soon as the circumjacent seas are open, to repair southward.

The HADDOCK, the WHITING, and the MACKAREL, are thought, by some, to be driven on our coasts by the pursuit of larger fishes: rather, they seek that food which is in greater plenty near the shore than out at sea. Their migrations seem remarkably regularly conducted,

conducted, even to a day. A shoal of haddocks often extends from the shore three miles in breadth, and in length forty. Its limits are precisely known; for if the fishermen put down their lines more than three miles from shore, they catch nothing but dog-fish; a proof the haddock is not there.

HERRINGS and PILCHARDS are in greatest abundance in the highest northern seas, covered with ice great part of the year, whither neither man, the fin-fish, or the cachalot, dares pursue them. The quantity of insect food those seas supply, is very great; so that, defended by the rigid climate, they live at ease, and multiply beyond expression. Anderson supposes they would never depart, but that their numbers render migration necessary; and, as bees in a hive, they are compelled to seek other retreats.

They quit the icy sea about the middle of winter, in such numbers, that were all the men in the world loaded with herrings, they would not carry a thousandth part away: but they barely leave their retreats, ere millions of enemies thin their squadrons. The fin-fish and the cachalot swallow thousands at a yawn; the porpessé, the grampus, the shark, the whole tribe of dog-fish, find them an easy prey: the unnumbered flocks of sea-fowl that chiefly inhabit near the Pole, watch their outset, and spread extensive ruin. Thus surrounded, they seek safety by crowding together, leaving to the outmost the danger of being first devoured, like sheep when frightened: they separate into shoals, one of which moves west, along the coasts of America, as far as Carolina. In Chesapeake bay, the annual inundation of these fish is so great, that they become a nuisance. Those that hold to the East, come down the coast of Iceland in the beginning of March; their phalanx, though after considerable diminutions, of amazing extent, depth, and closeness, covering an extent as large as the island itself. The whole water seems alive, and is black with them to a great distance. A shovel, or hollow vessel, put into the water, takes them up without farther trouble. That body which visits our coasts, appears off the Shetland isles in April. This is the fore-runner of the grand shoal in June, whose arrival is announced by the number of gannets, gulls, sharks, and porpesses. The main body, of such breadth and depth as to alter the appearance of the ocean, is divided into columns, five or six miles long, three or four broad; the water before them curls up as if forced from its bed. Sometimes they sink for ten or fifteen minutes, then rise again to the surface; and, in bright weather, reflect a variety of splendid colours, purple, gold, and azure.

The fishermen take sometimes two thousand barrels at a single draught of their nets. At the Shetland isles this great army divides, part to the western coasts of Ireland, where a second time they divide to the Atlantic Ocean and to the Irish Sea. They seek those bays and shores where they can best find food and defence. The quantity that attempts to return is but small; and Anderson doubts whether they ever return.

Many doubts arise on every part of this migration. Though such numbers perish, yet, in comparison to those that survive, the account is trifling: it is supposed that those taken by man, are not one to a million. Their leaving the shore at a stated time, seems not the impulse of necessity; neither is their fixing on some shores for ages, then capriciously forsaking them, never to return. This seems to indicate as if food had its share of attraction, and was not always in equal plenty. Before the year 1584, the number of ships that resorted to Norway was some thousands. The quantity of herrings was such, that a man who should put a spear in the water, as Olaus Magnus asserts, would see it stand on end. But soon after they deserted these shores for the German coast, where the Hanse-towns drove a very great trade by their capture and sale; but, for above a century, they have greatly forsaken them, and preferred the British Channel and the Irish shores.

The PILCHARD, which differs little from the herring, makes the coast of Cornwall its principal resort. The natives sometimes inclose a bay of several miles extent with their nets, called seines. The shoals are perceived by the colour of the water, which assumes a tincture from the fishes beneath. Sometimes twelve or fifteen hundred barrels are taken at a draught; often the quantity caught exceeds the salt or the utensils for curing them; and then they are carried off for manure.

Whence these infinite numbers are derived, remains obscure; but it is notorious that the STICKLEBACK, of two inches long, that might be thought easily supported in any water, is obliged to colonize, and leave its native fens. Every seventh or eighth year, amazing shoals of these appear in the river Welland, near Spalding, and come up the stream. They are supposed to be detached from some of the fens, overcharged with numbers. A man, employed by a farmer to take them for manure, got for a considerable time four shillings a day, by selling them at a halfpenny per bushel!

Such is the amazing propagation of fishes in our own climate; but this bears no proportion to the vast quantities in the Indian ocean, where it is but going down to the shore, and fish are found in great numbers,

numbers, in plashees that continue to have water; and where the quantity is so great, that they are left in shoals on swamps, dried by the sun, and their putrefaction contributes to render the country unhealthful.

A single herring, multiplying unmolested and undiminished for twenty years, would furnish a progeny greater in bulk than ten times our globe; so that the porpessie, the shark, the cod-fish, are benefactors, without whose assistance the sea would soon become overcharged with the burthen of its own productions.

Their spawn is deposited where the sun-beams may reach it, either at the bottom of shallow shores, or on the surface in deeper waters. A small degree of heat answers the purposes of incubation, and the animal issues from the egg in perfect formation.

Annually, in July, there appear near Greenwich shoals of small fishes, called by the Londoners White Bait. It is universally agreed that they are the young of some fish: they are never seen but at this time, and never have any roe. The quantity is amazing; and the fish that produces them in such numbers must be in plenty, though it is not yet known what that fish is, as they correspond with no other species whatever. Some think them the young of some animal not yet come to perfect form.

The manner in which the eggs of fishes are impregnated, is wholly unknown; but supposed to be by the male shedding his milt on them, when he meets them. Spinous fishes produce by spawn; yet some, as the eel and the blenny, bring forth their young alive.

With respect to the growth of fishes, it is observed that CARPS, the first year, grow to about the size of a willow leaf; at two years, are about four inches long; the third season, five inches; at four years old, six inches; the fifth, seven; afterwards from eight to twelve inches. Sea-fish, the fishermen assure us, must be six years old before it is fit for table. They assure us, MACKAREL, a year old, are as large as one's finger; those of two years, twice that length; at three and four years, they are that small kind of mackarel, without melts or roes; between five and six, they are full-grown fish. With regard to flat fishes, they tell us the turbot and barbel, at one year, are about the size of a crown piece; the second year, as large as the palm of one's hand; nor till the fifth and sixth year, large enough for table. So that fish are a considerable time in coming to their full growth, and are a long time destroyed, before they become destroyers.

Of the spinous kind, the DORADO is most voracious; chiefly found in the tropical climates; the most active and most beautiful of its tribe. The back enamelled with spots, blueish-green and silver; tail and fins gold colour, of extreme brilliancy: the eyes are on each side the head, large and beautiful, surrounded with circles of shining gold. These fish are always in motion, and play round ships in full sail, with ease and security. Ever pursuing or pursued, they are continually in warfare; defending themselves against the shark, or darting after smaller fishes. The FLYING-FISH abounds in these seas; and being small, seldom larger than a herring, is chiefly sought by the dorado, which being six feet long, not thicker than a salmon, and furnished with a full complement of fins, divides the water with amazing rapidity. The flying-fish has two pair of fins longer than the body, and moved by a stronger set of muscles than any other. The efforts to seize on one side, and the arts of escaping on the other, are perfectly amusing. The dorado is seen in full chace, darting after its prey, which will not leave the water, while it has the advantage of swimming, in the beginning; but, tired at last, and its long fins growing useless in the water, they are now exerted in flight, in a different manner and direction: by this means he rises from the water, flutters over its surface two or three hundred yards, till enfeebled by this exercise; but they have now acquired a power of fresh efforts in the water, and of swimming with some velocity: still the active enemy keeps it in view, and drives it again from the deep, till it drops at last into the mouth of its fierce pursuer. Should it escape from its enemies of the deep, yet the tropic bird and the albatross are ever upon the wing to seize it, and often whole shoals of them fall on ship-board.

It would seem that there is something more favourable to the fecundity of fishes in the ocean than in fresh water. In fresh water also fishes seem to abate much of their courage and rapacity; pursue each other with less violence, and seem to be less powerfully actuated. The cod on the banks of Newfoundland, the instant the hook, which is only baited with the guts of the animal last taken, is dropped into the water, darts to it at once, and the fishermen have to pull up as fast as they throw down: whereas those who fish in fresh waters must wait whole hours in fruitless expectation; and *the patience of an angler* is proverbial.

The PIKE is the most active and voracious of fresh water fishes, and will attack every fish less than itself; sometimes is choked, by attempting to swallow such as are too large: fish of all kinds, even its own, it indiscriminately

The Flying Fish.

discriminately devours, so that every fish owes its safety to its minuteness, celerity, or courage. The pike will draw down the water-rat and young ducks while swimming about. Gesner mentions a mule that stooped to drink, when a famished pike that was near seized it by the nose, nor was it disengaged till the beast flung it on shore. They will contend with the otter for his prey, and endeavour to force it from him. For this reason it is dreaded by all other fish; and small ones shew the same uneasiness and detestation at the presence of their tyrant, as little birds do at the sight of an hawk or an owl. When the pike lies asleep near the surface, as is frequent, the lesser fish are often observed to swim around it in vast numbers, with a mixture of caution and terror.

Other tribes of fresh water fish chiefly subsist on worms and insects, pursuing them at the bottom, or jumping after them to the surface. In winter their appetite seems to forsake them, at least they continue so torpid, that few baits will tempt them. They continue in deep holes for days together, without appearing to move. The cold seems to affect them, they lie close to the bottom, and seldom venture out except the day be fine, and the shallows tepidified by the rays of the sun. Some fishes may be rendered so torpid by the cold, in the northern rivers, as to be frozen up in their great masses of ice, in which they continue for several months, the prisoners of congelation, waiting the approach of a warmer sun, to restore life and liberty.

Each species of fish is infested with worms of kinds peculiar to itself. These lodge either in the jaws, and the intestines internally, or near the fins externally. When healthy and fat, fish are not much annoyed by them; but in winter, when lean or sickly, they suffer very much. In some seasons they suffer epidemic disorders, and are seen dead by the water-side, without apparent cause; yet they are animals of all others most vivacious, and often live on substances poisonous to the more perfect classes of animated nature. Whether the poisonous qualities of some may not arise from this cause is uncertain. That they inflict poisonous wounds is the opinion of many. Their being poisonous, when eaten, is equally notorious; and the cause equally inscrutable. Others have ascribed the poison of these fishes to their feeding upon copperas beds. With us, if fishes, such as carp or tench, acquire any disagreeable flavour from the lakes in which they have been bred, this can be removed, by their being kept some time in finer and better water.

O F S H E L L F I S H.

THESE are divided by naturalists into Crustaceous and Testaceous : both totally unlike fishes in appearance, without bones on the inside, but having a shell as an external covering. Crustaceous fish have a shell not quite of a stony hardness, but in some measure capable of yielding. Testaceous fishes have a shell of a stony hardness, brittle, and incapable of yielding. Of the crustaceous kinds are the lobster and the crab : of the testaceous, oysters, muscles, cockles, and sea snails, in infinite variety.

The crustaceous tribe seems placed between fishes, properly so called, and the snail-like or testaceous tribes. They have motion, and hunt for food with great avidity, like the former ; but are incapable of swimming, and creep along the bottom, like the latter. The chief of the kind is the Lobster ; under which we rank the Prawn, Cray-Fish, Shrimp, Sea-Crab, Land-Crab, and their varieties.

T H E L O B S T E R K I N D.

THE Lobster and the Crab are in manners and conformation nearly the same. Voracious like fishes, they lead an insect life at the bottom of the water ; and are often obliged to wait till accident brings their prey. They have neither red blood nor warmth in their bodies. Whatever they seize on is sure to perish, though never so well defended ; they even devour each other : and may, in some measure, be said to eat themselves ; as they change their shell and their stomach every year, and their old stomach generally serves to glut the new.

Those who first see the Lobster, are apt to mistake the head for the tail. The animal moves with its claws foremost. These are his instruments of provision and defence ; these open like a pair of nippers, have great strength, take firm hold, and are usually notched, which increases their tenacity. The Lobster has eight legs, four on each side ; these, with the tail, give the animal its progressive and sideling motion. Between the two claws is the head, small ; its eyes seem like two black
horny

horny specks on each side; these it can advance out of the socket, or withdraw, at pleasure. The mouth opens the long way of the body; has two teeth for the comminution of its food; three more are in the stomach, one on each side, the other below. Between the two teeth is a fleshy substance, in the shape of a tongue. The intestines are one long bowel, from the mouth to the vent; but this animal is singular in having the spinal marrow in the breast bone. Two long feelers or horns issue on each side the head, as if to apprise the animal of danger, or prey. The tail is the grand instrument of motion; and with this it can raise itself in the water. Under this is lodged the spawn in great abundance; every pea adhering to the next by a very fine filament. Lobsters are supposed to be self-impregnated! The ovary, or place where the spawn is first produced, is toward the tail, where a red substance is found, which is a cluster of peas, too small for exclusion. From this receptacle go two canals, that open on each side at the jointures of the shell, at the belly; through these passages the peas descend to be excluded, and placed under the tail, where the animal preserves them from danger for some time, till they come to maturity; when, being furnished with limbs and motion, they drop off into the water.

When the young Lobsters leave the parent, they seek refuge in the smallest clefts of rocks, and crevices at the bottom of the sea. They grow larger in a few weeks, from the accidental substances which the water washes to their retreats. They also acquire a hard, firm shell, or armour. They then quit their fortresses, and creep along the bottom, in hopes of plunder. Fish spawn, smaller of their own kind, but chiefly worms at the bottom of the sea, supply them with plenty.

But the body of the Lobster increasing, while the shell remains the same, it becomes imprisoned within its shell. Young Lobsters change their shell oftener than the old, who remain in the same shell sometimes two years together; but usually all change their shell yearly, generally at the beginning of summer, when food is in plenty, and their vigour in perfection: soon their activity ceases; they forsake the open parts of the deep, seeking retired situations among the rocks or outlets, where they may remain in safety. Some days before the change, the animal discontinues its usual voraciousness; is no longer seen harrowing up the sand at the bottom, or fighting, or hunting, but torpid and motionless. Just before casting its shell, it throws itself on its back, strikes its claws against each other, and every limb seems to tremble; its feelers are agitated, and the whole body in violent motion: it then swells in an unusual manner; at

last the shell begins to divide at its junctures ; particularly at those of the belly, before but seemingly united. It also seems turned inside out ; and its stomach comes away with its shell. After this, it disengages the claws, which burst at the joints, with a tremulous motion casting them off. Now, weak and enfeebled, it continues several hours motionless ; many die ; all are in such a weakly state, that they neither take food, nor venture from their retreats ; they have not only the softness, but the timidity of a worm. The dog-fish, the cod, and the ray, devour them by hundreds. This defenceless state continues but a short time : in less than two days the skin is grown almost as hard as before ; its appetite increases, and the first object of its gluttony is said to be its late stomach. This it devours eagerly, and also its former shell. In about forty-eight hours the new shell is perfected, and hard as the former which was but just thrown aside. By its new shell is seen that it has grown in a very few days above a third in size.

At certain seasons of the year, these animals never meet without engagement. The loss of a leg, or a claw, is no great calamity ; the victor carries off the spoil to feast on, while the vanquished retires from the defeat, to wait for a thorough repair. Where the joint of the claw was cut away, is seen in a most surprising manner to burgeon out, the beginning of a new claw ; at first small and tender, but in three weeks time almost as large and powerful as the old one : but it never arrives to the full size.

Of this extraordinary yet well-known creature, are many varieties. Some three feet long, and (if the shrimp and the prawn be of the class, though unfurnished with claws) others not above an inch. All live in the water, and can bear its absence for a few hours. The shell is black when fresh, but turns red by boiling.

The Lobsters creep into a basket of wicker-work, let into eight or ten fathom water, for the bait, but cannot get out again. The river Cray-fish differs little from the Lobster, but that it lives only in fresh water ; the other only in the sea.

The CRAB is found equally in fresh and salt water ; upon land as well as in the ocean ; its shape differs much from the Lobster, which it resembles in habits and conformation. The tail is the broad flap that covers part of the belly, and when lifted discovers the spawn in great abundance. Its claws are two ; its legs eight, four on either side. It is bold, and voracious, and quarrelsome. It resembles the Lobster, except in its amazing

ing bulk of body compared to its head, and the length of its intestines, which have many convolutions.

The LAND CRAB is found in some of the warmer regions of Europe, and abundantly in the tropical climates of Africa and America. Various kinds, endued with various properties; some healthful, delicious, and nourishing; others very poisonous and malignant; some half an inch, others a foot broad; some are of a dirty brown; others beautifully mottled.

That called the VIOLET CRAB, of the Caribbee Islands, is the most noted for its shape, its delicacy, and its manners. It somewhat resembles two hands cut through the middle and joined together; for each side looks like four fingers, and the two claws the thumbs. The body is covered with a shell as large as a man's hand, bunched in the middle, on the fore-part of which are two long eyes, the size of a grain of barley, transparent as crystal, and hard as horn. A little below these is the mouth, covered with a sort of barbs, under which are two broad sharp teeth, white as snow; not placed cross-ways, but rather like the blades of a pair of scissars. With these teeth they cut leaves, fruits, and rotten wood, which is their usual food. But their principal instrument for seizing is their nippers, which hold so tight, that the animal loses the limb sooner than its grasp; and is often seen scampering off, having left its claw still holding fast the enemy, which keeps for above a minute fastened on the finger after the crab is making off. In fact, it loses no great matter by leaving a leg or an arm, for they soon grow again. They live in a kind of society in the mountains; but regularly once a year march down to the sea-side, in a body of some millions. They chuse April or May for their expedition; falling out by thousands from hollow trees, the clefts of rocks, and holes which they dig under the earth. The procession sets forward from the mountains, with the regularity of an army under the guidance of an experienced commander. The first division consists of the strongest and boldest males. These are often obliged to halt for want of rain. The main body is composed of females (which never leave the mountains till the rain is set in) forming columns of fifty paces broad, and three miles deep, almost covering the ground. Three or four days after this the rear guard follows; a straggling tribe of males and females, neither so robust nor so numerous as the former. The night is their chief time of proceeding; but if it rains by day, they profit by it, and move forward in their slow uniform manner. When the sun shines hot, they halt, and wait till the cool of the evening. When terrified,

terrified, they march back in confusion, holding up their nippers, which they often clatter together, as if threatening their disturbers. If any one is maimed, and incapable of proceeding, the rest devour it on the spot, and pursue their journey. After a thousand dangers (sometimes during three months) they arrive at their destined port, and prepare to cast their spawn. The peas are within their bodies, not under the tail; for the creature waits the benefit of the sea-water to help delivery. The Crab having reached the shore, eagerly goes to the water's edge, and lets the waves wash over its body, then withdraws to land. In a little time the spawn grows larger, is excluded, and sticks under the tail, as big as a hen's egg, and exactly resembling the rows of herrings. In this state they once more seek the shore, and shaking off their spawn into the water, leave accident to bring it to maturity. At this time shoals of fish attend, in expectation of this annual supply; and two thirds, perhaps, of the crabs eggs are immediately devoured by them. Those that escape are hatched under the sand; and soon after millions of little crabs are seen quitting the shore, and slowly travelling up to the mountains. The old ones have become so feeble and lean, they can hardly creep, and their flesh changes its colour. Most of them continue in the flat parts of the country till they recover, in holes in the earth: there throwing off their old shells, as it were whole, the place where they opened on the belly being unseen: they become naked, and almost motionless for a week together. They have under their stomachs four large white stones, which gradually decrease as the shell hardens, at which time the animal is seen slowly making its way back; all this is commonly performed in six weeks. This Crab, when in the mountains, is impregnable; subsisting on vegetables, it seldom ventures out; and its habitation is inaccessible. It is only when compelled to descend into the flat country that it is taken. The natives wait its descent, and destroy thousands; but only seek that small spawn which lies on each side the stomach within the shell, about the thickness of a man's thumb. On their return, being covered with a new skin, resembling soft parchment, almost every part except the stomach may be eaten. They are taken in their holes by feeling for them in the ground with an instrument; or sought after by night with flambeaux. The instant it perceives itself attacked, it falls backward, and with its claws pinches most terribly. But the dexterous crab-catcher takes them by the hinder legs in such a manner, that its nippers cannot touch him, and throws it into his bag.

Many are found poisonous, having fed, as it is thought, on the manchineel

chinel apple; and whenever they are found under that noxious plant, they are always rejected.

The **SOLDIER CRAB** has some similitude to the Lobster, without its shell. Usually four inches long, no shell behind, but covered to the tail with a rough skin, terminating in a point: strong hard nippers before, like the Lobster; one of them is as thick as a man's thumb, and pinches most powerfully. These have no shell, but take possession of one deserted by some other animal; it there resides till too large for its habitation: like the former, descending yearly from the mountains to the sea-shore, to deposit its spawn, and to procure a new shell. It is very probable that its first care is to provide for its offspring; and it is thought, from the number of little shells which it is seen examining, that it deposits its spawn in them. After many trials and combats for a new shell, the soldier is equipped. There is often a contest between two for some well-looking favourite habitation; both endeavouring to take possession; they strike with their claws; and bite till the weakest is obliged to yield.

When this animal is taken, it sends forth a feeble cry, endeavouring to seize the enemy with its nippers; with which, if it fastens, it will sooner die than quit the grasp. The wound is very painful, and not easily cured. For this reason, and as it is not much esteemed for its flesh, it is generally permitted to return safely to its old retreat in the mountains.

TESTACEOUS FISHES.

THE manners of this class of creatures, that for the most part creep along the bottom, or are driven by the waves, is almost entirely unknown. The wreathing of their shells, or their spots, have been described; but of their appetites, combats, escapes, and arts of subsistence, we are ignorant.

A shell is a natural habitation; hard and stony; often partly derived by the animal from surrounding objects; the fluids of the animal furnishing the cement. These unite into that firm covering which shell-fish generally reside in.

As we cannot describe the modes of the deep, and its peculiarities, to give exact ideas of the manner in which sea-shells are formed, we must advert to an animal within our inspection, with the formation of whose shell we are best acquainted: such is the Garden-Snail, with whose history Swammerdam has taken endless pains. The same manner of formation extends to all animals having shells, whether on land or in the water. The young snail, at leaving the egg, carries its shell on its back, being arrived at a certain growth, and its little habitation sufficiently hardened. This beginning of the shell only equals a pin's head, but grows rapidly, having at first but two circumvolutions. As the animal increases in size, these circumvolutions increase also, until they be five in number, which is never exceeded in land snails, but sea snails sometimes have ten. The animal enlarges its shell at the mouth, with its little teeth biting and clearing away the scaly skin from the edges, and then adds another rim to its shell. Its whole body is furnished with glands, from which flows out a kind of slimy fluid, like small spiders threads, which unite in one common surface, and by time condense into a stony hardness. It is that glistening substance which it leaves after its track. This fluid passes through an infinite number of little glands till it arrives at the pores of the skin, but is there stopped by the shell below; and therefore rises to the mouth of the shell, where enlargement is wanted. There the first layer of slime soon hardens; then another is added, which hardens also, till the shell becomes as thick as is requisite. Thus every shell may be considered as composed of a number of layers of slime, which have entirely proceeded from the animal's own body. If the external coat be scaled off, the inner substance will be found of one simple colouring; which hints that the animal's own juices give only one colour; whereas we see some shells stained with an hundred: sometimes perhaps borrowed from surrounding objects. Others think, that as in the body of every one of these animals several streaks are discerned of a different colour, the juices flowing from those parts will be also of a different hue, and will conformably tinge that part of the shell which their slime composes.

Shells have generally a white ground, tinged with red, yellow, brown, green, and other shades and mixtures, but never blue; for blue is a colour which sea-water changes.

Convolutions, prominences, and general form depend on the animal, and usually bear some resemblance to the body on which they are moulded.

moulded. If the animal has any tumour or excrescence, it creates a swelling in that part of the incrustation to which it corresponds. When it makes additions to its apartments, the same protuberance which had raised the shell before, swells it again at some little distance, by which the same inequality runs spirally all round the shell. Sometimes these tumours are so large, or pointed, that their counterparts in the incrustation appear like horns: these quitted, and others made, increases their number. If the body be channelled, the shell that covers it will be channelled likewise. Their diversity is so great, their figures and colours, so very striking, that several persons have made their arrangement the business of their lives. Some shells, such as the Stairs Shell, or the Admiral Shell, are equally precious, by their scarceness, as pearls. Shells exhibit great difference of figure; flat, concave, long, lunated, drawn round in a circle, the orbit cut in two; some rising on the back, some smooth, some wrinkled, toothed, streaked, the point variously intorted, the mouth pointing like a dagger, folded back, bent inwards: all these variations, and many more, furnish at once novelty, elegance, and speculation.

Aristotle has divided them into three kinds: first, the Univalve, or Turbinated, which consist of one piece, like the box of a snail; secondly, the Bivalve, consisting of two pieces, united by a hinge, like an oyster; thirdly, the Multivalve, consisting of more than two pieces, as the Acorn Shell, which has not less than twelve. Those fished up from the deep, are called by the Latin name *pelagii*; those cast on shore, are called *littorales*. Many of the *pelagii* are never seen on shore; they continue in their native depths, and we owe their capture to accident.

Sea-shells exceed both land and fossil shells in beauty, in high polish, and in brilliant and various colouring. Fresh-waters have but two kinds of shells; the bivalved and the turbinated. Land shells are but of one kind, the turbinated; but in that are four or five very beautiful varieties. Fossil, or *extraneous* shells, are in great numbers, and of as many kinds as in the sea itself, and which our most exact and industrious shell-collectors have not been able to fish up from the deep, and probably thousands of different forms still remain at the bottom unknown.

OF TURBINATED SHELL-FISH.

TO conceive the manner in which certain animals subsist at the bottom of the deep, we must again have recourse to one of a similar nature and formation that we know.

The Snail is supprisingly fitted for the life it is to lead. Its organs of life are almost as complete as the largest animal; tongue, brain, salival ducts, glands, nerves, stomach, intestines; liver, heart, and blood-vessels: besides this, it has a purple bag that furnishes a red matter to different parts of the body, together with strong muscles that hold it to the shell, and which are hardened, like tendons, at their insertion.

Its first striking peculiarity is its eyes on the points of its largest horns. When the Snail is in motion, four horns appear; the two uppermost and longest deserve peculiar consideration, having the eyes fixed at their extreme ends, appearing like two blackish points. When taken out of the body, they are of a bulbous figure; they have but one coat; and the three humours, the vitreous, the aqueous, and the crystalline, are indistinct. The eyes are directed to different objects at pleasure, by a regular motion out of the body; or hidden, by a very swift contraction into the body. Under the small horns is the mouth, furnished with eight ridges or teeth.

Every snail is at once male and female; and while it impregnates another, is itself impregnated; vessels supplying the fluid are placed chiefly in the fore part of the neck, and extend over the body; but the organs of both sexes are always found united, and growing together. A large opening on the right side of the neck, gives a passage to excrements, serves as an opening for respiration, and also as an organ of generation; within which each has other necessary parts, and from which apertures, they being greatly dilated, two organs, resembling intestines, are seen issuing: from the same aperture they lance a kind of dart, which is pretty hard, barbed, and ending in a very sharp point; some minutes after, the snail which received the weapon, darts one of its own at its antagonist, which is received in like manner; then softly approaching nearer, they close with each other. This is generally thrice repeated, at intervals of fifteen days; and, at every time, a new dart is mutually emitted.

After

After eighteen days they produce their eggs, at the opening of the neck, and hide them in the earth with the greatest solicitude. These eggs are in great numbers, round, white, and covered with a soft shell; sticking to each other by an imperceptible slime: about the size of a small pea.

Sometimes these animals are crushed seemingly to pieces and utterly destroyed; yet, in a few days, they mend their numerous breaches by the same substance of which the shell is originally made. They are sometimes seen with eight or ten of these patches; but though possessing power to mend its shell, it cannot, when at full growth, make a new one.

The Snail is very voracious; subsists on the leaves of plants and trees; but is very delicate in its choice. The animal moves forward by means of that broad muscular skin which sometimes is seen projecting round the mouth of the shell; this is expanded before, and then contracted with a kind of undulating motion; also by its slimy substance, with which it is copiously furnished, and which it emits wherever it moves, as on a kind of carpet, it proceeds slowly along, without danger of wounding its tender body against asperities; by this it ascends to its food on trees, and by this descends, without danger of falling, and breaking its shell.

At the approach of winter, the Snail buries itself in the earth, or retires to some hole, to continue torpid during the severity of the season: sometimes alone; but more frequently several are found together, apparently deprived of life and sensation. For warmth and security, the Snail forms a cover or lid to the mouth of its shell with its slime, which stops it up entirely, and thus protects it from every external danger: this is whitish, pretty hard and solid, yet porous and thin to admit air, without which the animal cannot live. The Snail awakes one of the first fine days of April, breaks open its cell, and sallies forth for nourishment: being very voracious, at first almost any vegetable that is green seems welcome; but the succulent plants of the garden, and the various kinds of pulse, are at some seasons almost wholly destroyed by their numbers. So great is the multiplication of snails at some years, that gardeners imagine they burst from the earth. A wet season is generally favourable to their production; for very dry seasons, or dry places, cause too great a consumption of its slime, without plenty of which it cannot subsist in health and vigour.

Of the Sea-Snail naturalists have mentioned fifteen kinds; of the Fresh-water-Snail eight kinds; and of the Land-Snail five. These strongly resemble

resemble the garden snail, in the formation of their shell, in their hermaphrodite natures, in the slimy substance with which they are covered, in the formation of their intestines, and in the disposition and uses of the hole on the right side of the neck; yet there are one or two remarkable distinctions: the FRESH-WATER SNAIL, and probably all snails that live in water, have a contrivance for rising to the surface, or sinking to the bottom. This is by opening and shutting the orifice on the right side of the neck, which is furnished with muscles for that purpose, in order to draw in or expel the air, as it finds occasion. By dilating this it rises; by compressing it, it sinks. It is also viviparous, and brings forth its young not only alive, but with their shells, in some degree of perfection.

“March 12,” says Swammerdam, “I began my observations on this snail, and collected a great number, which I put into a large basin filled with rain-water, and fed for a long time with potter’s earth dissolved in it. I opened one of these snails, when I found nine living snails in its womb: the largest were placed foremost, as the first candidates for exclusion. I put them into fresh-water, and they lived to the eighteenth of the same month, moving and swimming, like snails full grown.”

Of the sea kinds also, some are viviparous, while other lay eggs. Such are one or two of the Buccinums; within which living young have been frequently found upon dissection. In general the rest of this numerous class bring forth eggs; from whence the animal bursts at maturity; completely equipped with an house, which the element where it resides does not prevent from enlarging.

Among some of the sea kinds one impregnates the other; but is incapable of impregnation by the same, and receives it from a third, which is itself impregnated by a fourth. In this manner Mr. Adanson has seen vast numbers of sea snails united together in a chain. In the *bulin* and the *coret* the orifices are separate from each other: that which performs the office of the male being at the origin of the horns; the other farther down on the neck. In general all that have this orifice on the right side, have their shells turned from right to left; on the contrary, those which have it on the left side, have their shells turned from left to right.

Many sea snails want horns, and none have above two. Eyes are unnecessary to creatures whose food is usually concealed in the darkest places; and who, possessed of very little motion, are obliged to grope for what they subsist on.—Sea snails are larger than land snails.

The mouth, in the garden and the fresh-water snails, is placed crosswise,

PLATE I

FIGURE 1

FIGURE 2

PINNA MARINA

PHOLADE

F

F

NAUTILUS

wife, as in quadrupedes. In most sea snails, the mouth is placed longitudinally, but in some obliquely, or on one side. Others, of the Trochus kind have no mouth; but a trunk, very long in some kinds, and shorter in others. This trunk is fleshy, muscular, supple, and hollow. Its extremity is bordered with a cartilage, and toothed like a saw. These are, among snails, what the tiger, the eagle, or the shark is among beasts, birds, or fishes. The whole race of shelled animals avoid their approach; though of a thick clumsy shell themselves, they move with greater swiftness at the bottom than most shell fish; and seize their prey with greater facility. No shell so large but they will boldly venture to attack it; and, with their piercing auger-like trunk, will quickly bore it through. No efforts the invaded animal makes avail: if it expand itself, and rise to the surface, the enemy rises with it; if it sink to the bottom, its destroyer closely adheres. Thus this carnivorous shell-fish sticks for several days, or weeks, to its prey, until with its trunk it has sucked out all substance, or until it drops off when the other begins to putrefy.

Beside a thick shell, many snails are furnished with a lid, which opens and shuts at pleasure. When hunting for food, it opens its box, gropes or swims about; when satisfied, drops its lid, and sinks to the bottom; where it might be supposed in perfect security, but that the trochus breaks into its inclosure. Scarce a shell is met with entire and sound to the end of its convolutions; but the thinnest shells are most subject to this invasion.

Of all sea snails, that most frequently seen swimming, and whose shell is thinnest, is the NAUTILUS. Whether it is thus employed in escaping its enemies at the bottom, or in seeking food at the surface, may be doubted. Its stomach contains chiefly food found at the bottom. Its industry, therefore, may be owing to its fears; and its arts of sailing may have been originally the product of necessity.

There are several species of the nautilus, yet all may be resolved into two: one with a white shell, thin as paper, which it often quits, and resumes; the other with a thicker shell, sometimes of a beautiful mother-of-pearl colour, and that quits its shell but rarely. This shell outwardly resembles that of a large snail, but is generally six or eight inches across: within, it is divided into forty partitions, that communicate with each other by orifices through which one could scarce thrust a goose-quill: almost the whole interior is filled by the animal; whose body is divided into as many parts as its shell has chambers: these parts communicate with each other, though the openings, by a long blood-vessel, which runs

from the head to the tail: thus the body of the animal, when out of the shell, resembles a number of soft bits of flesh, threaded on a string. How it contrives to disengage its body from so intricate an habitation; how it makes a substance, to appearance almost as thick as one's wrist, pass through forty openings, each scarcely admitting a goose quill, is not discovered: but the fact is certain; for the animal is often found without its shell; and the shell more frequently without the animal. This animal, particularly that of the white light kind, is chiefly found in the Mediterranean. When the sea is calm, they are observed floating on the surface; some spreading their little sail; some rowing with their feet, as if for life and death; others floating on their mouths, like a ship keel upwards. If taken while thus employed, the extraordinary mechanism of their limbs for sailing appears manifest. The nautilus is furnished with eight feet, which issue near the mouth, and may as properly be called barbs: these are connected to each other by a thin membrane, like that between the toes of a duck; but much thinner and more transparent. Of these eight feet thus connected, six are short: these are held up as sails to catch the wind; the two others, being longer, are kept in the water; serving, like paddles, to steer its course. When the weather is quite calm, and the animal is pursued from below, it expands only part of its sail, rowing with the rest: when interrupted, or alarmed from above, it instantly furls the sail, catches in all its oars, turns its shell mouth downward, and sinks to the bottom. Sometimes it is seen pumping the water from its leaking hulk; and, when unfit for sailing, deserts its shell entirely. The forsaken hulk is seen floating along, till it dashes, by a kind of shipwreck, on the rocks or the shore.

OF BIVALVED SHELL-FISH, OR SHELLS OF THE OYSTER KIND.

WE shall find these in every respect inferior to snails we have been describing; in their sensations; in their powers of motion; in their generation. All the bivalve tribe are hermaphrodite, but require no assistance from each other towards impregnation; and a single mussel or oyster, were there no other in the world, would quickly replenish the ocean.

As the land snail, being best known, took the lead in the former class, for the same reason the fresh-water mussel may take the lead in this.

The mussel of fresh or salt water has two equal shells, joined at the back by a strong muscular ligament that serves as a hinge. The animal can open its shells, at pleasure, about a quarter of an inch. It is fixed to each shell by four tendons, which shut them close, and keep its body firm from being crushed by any shock against its own habitation. Its vital organs are situated in a very extraordinary manner. It has a mouth furnished with two fleshy lips; its intestine begins at the bottom of the mouth, passes through the brain, and makes a number of circumvolutions through the liver; then goes on straight into the heart, which it penetrates, and ends in the anus; near which the lungs are placed, and through which it breathes, like those of the snail kind; and in this manner its languid circulation is thought to be carried on. Each mussel has two ovaries, by which it is female; and two seminal vessels, as a male. Each has its own proper canal: by the ovary canal the eggs descend to the anus; where the seminal canals send their fluids to impregnate them. Thus one single animal suffices for generation; and the eggs are impregnated and excluded by itself alone. The ovaries usually empty themselves of eggs in spring, and are replenished in autumn. The fecundity of the snail kind is trifling in comparison to the fertility of these. Their quick multiplication alone insures the continuation of their species.

The multitude of these animals in some places is very great; but the numbers of their destroyers are in equal proportion. The crab, the cray-fish, and many other animals, devour them; and the trochus is their most formidable enemy. But it seems still more fearful of the agitations of the element in which it resides; for if dashed against rocks, or thrown far on the beach, it is inevitably destroyed. To guard against this, the most fatal of accidents, it is furnished with a capacity of binding itself by a number of threads to whatever object it approaches: these Reaumur supposed it spun artificially, as spiders their webs; but the extreme length of this beard in some, which far exceeds that of the body, seems impossible to be manufactured by thrusting out and drawing in the tongue, with the glutinous matter of which the French philosopher supposed those threads were formed. It also increases with the animal; and, as the mussel becomes larger and older, the beard becomes longer, and its filaments stronger. By these threads they adhere to fixed objects; and sometimes, when such are wanting, to each other; and though thrown into a lake separately, they are taken out in bunches of many together.

Its instrument of motion, from place to place, is that muscular substance resembling a tongue, which is in some two inches long, in others not one. This, being thrust out of its shell, is capable of making a slight furrow in the sand. By means of this furrow the mussel can erect itself on the edge of its shell; and prolonging this furrow as it advances, it projects its tongue, that answers the purpose of an arm, and thus carries its shell edge-ways, as in a groove. Where it determines to reside, it fixes the ends of its beard; and thus, like a ship at anchor, braves all the agitations of the water. Sometimes the animal is attached by a large number of threads; sometimes but by three or four, that seem scarce able to retain it. It lives on little earthy particles that the water transports to its shells, and perhaps the flesh of the most diminutive animals. However, some of this kind have been found a foot long. Of the beard the natives of Palermo sometimes make gloves and stockings.

These shell-fish are found in lakes, rivers, and the sea. Those of lakes often grow very large; but they seem solitary, and are found generally separate. Those of rivers are not so large, but more numerous: the sea mussel is the most abundant. These are often bred artificially in salt-water marshes overflowed by the tide: being thrown in at proper seasons, undisturbed by the agitations of the sea, and not preyed on by their powerful enemies, they cast their eggs, which soon become mature, and are generally found in clusters of several dozen together. It requires a year for the peopling a mussel-bed; so that, if the number consists of forty thousand, a tenth part may annually be left for peopling the bed anew.

The OYSTER differs little from the mussel, except in its thickness of shell, and greater imbecillity. Has organs of life and respiration, very voluminous intestines, a liver, lungs, and heart. Is self-impregnated; opens its shells to receive the influx of water, and is strongly attached to its shell both above and below. These shells are not equal, one being cupped, the other flat; it always rests on the cupped shell, for if it lay on the flat side it would lose all its water. Its shells are so strongly lined and defended, that no animal will attempt to pierce them. But it often serves as an object to which pipe-worms, corallines, and other little animals, fix their habitation, and live in security. Among the number of these is a little red worm, often found on the shell; which some erroneously supposed to impregnate their spawn. The oyster is utterly unable to change its situation; but is attached very firmly to objects. Rocks, stones, timber, sea weeds, all seem proper to give it a fixture, and to secure it against the agitation of the waves. Nothing

so common in the rivers of the tropical climates, as to see oysters hanging amidst the branches of the forest. Many trees which grow along the banks bend their branches into the water, particularly the mangrove. To these the oysters hang in clusters, like apples on a tree; and as the weight of the fish sinks the branch into the water, where it still continues growing, the number of oysters increase, and hang upon it. They are often found to stick to each other. This is effected by means of a glue proper to themselves, which, when cemented, is as hard as the shell, and is as difficultly broken. The joining substance, however, is not always glue; but the animal grows to the rocks, somewhat like the mussel, by threads which take root in the shell, and not from the body of the fish.

Oysters usually cast their spawn in May, which at first appear like drops of candle-grease, and stick to any hard substance: these are covered with a shell in two or three days. In three years the animal is large enough to be brought to market. Oysters prepared in beds are not so large as rock-oysters, which are sometimes as broad as a plate, and admired by some as excellent. In the East Indies, some oyster shells are two feet over, and the fish capable of furnishing a plentiful meal to eight or ten men; but no way comparable to ours for flavour.

Other bivalved shell-fish, the cockle, the scallop, and the razor-shell, have other small differences in form or manners; but their power of changing place is their greatest difference. The SCALLOP is remarkable for its method of moving on land, or swimming on the surface of the water. When deserted by the tide, it makes remarkable efforts to regain the water. First gaping widely its shells, often an inch, then shutting them with a jerk, it rises five or six inches from the ground. It thus tumbles any how forward repeatedly, till it has attained its journey's end. When in the water it is capable of supporting itself on the surface; there opening and shutting its shells, it tumbles over and over, and makes its way with some celerity.

The PIVOT or RAZOR-SHELL has a very different kind of motion; having only a power of sinking point downward. Its shells resemble the haft of a razor; and by this form it is better enabled to dive into the soft sand at the bottom. All its motions are confined to sinking or rising, a foot downwards or upwards, in the sand; for it never leaves the spot where first it was planted. From time to time it is seen to rise about half way out of its hole; but, if disturbed, it sinks perpendicularly down again. Just over the place where the razor is buried, is a small hole like a chim-

a chimney, through which the animal breathes, or imbibes the sea-water. At low water, these holes are easily distinguished by the fishermen, whose method of enticing the razor up from the depth of its retreat is by sprinkling a little sea-salt on the hole. This melting, no sooner reaches the razor below than it rises instantly straight upwards, and shews about half its length above the surface. This is instantaneous; and if the fisher does not seize the opportunity, the razor buries itself with great ease to its former depth. There it continues secure; no salt can allure it a second time; but it remains unmolested, unless the fisher will be at the trouble of digging it out sometimes two feet below the surface.

In this class of shell-fish PEARLS are found usually generated, in the internal parts of shells that are of a shining silvery colour, as well in the mussel or the scallop as in the oyster, and in all bivalved shells whose insides resemble mother-of-pearl. The oyster that breeds a large pearl always breeds a large shell, and the shell itself indents to receive its impression. The pearl is probably accidentally produced by the same matter as forms the shell. It is soft at first, but quickly hardens; and by successive coats, layer over layer, acquires its dimensions. Sometimes a small speck is seen in the middle, on which the coats were originally formed. The pearl oyster has a large strong whitish shell, wrinkled and rough without, within smooth and silver-coloured. From these mother-of-pearl is taken, which is the internal coats of the shell. The pearl is chiefly prized; being found but in few, generally adhering, sometimes making a print in the body of the shell, sometimes at large within the substance of the fish.

There are many pearl fisheries in America and Asia; but those of America are greatly discontinued. The most famous of the Asiatic fisheries is in the Persian Gulph, and the most valuable pearls are brought from thence. Their value increases in proportion to their size, their figure, and colour; some are white, others yellowish, others a lead colour, and some black as jet. What occasions these different tinctures is unknown. All pearls in time become yellow; they may be considered as an animal substance, converted into a stony hardness, and like ivory taking a tincture from the air. They also decay if kept in damp or vaulted places, and moulder into a substance scarce harder than chalk.

SEA ERCHINS

N^o 1

N^o 2

N^o 3

N^o 4

N^o 5

N^o 6

OF MULTIVALVE SHELL-FISH.

OF these are principally two kinds; such as move, and such as are stationary: the first are often known by the name of *sea-eggs*; by naturalists, Echini, or Urchins: the latter are called Pholades or File-Fish. Of both there are several sorts.

The SEA-URCHIN may be compared to the husk of a chestnut, being round, and with bony prickles on every side. The mouth is below, the vent above; the shell is a hollow vase, resembling a scooped apple, filled with a soft, muscular substance, through which the intestines wind from the bottom to the top. The mouth is large and red, furnished with five sharp teeth, which are easily discerned. The jaws are strengthened by five small bones, in the centre of which is a small fleshy tongue; from this the intestines make a winding of five spires, round the internal sides of the shell, ending at the vent at top. Its horns are moveable, like the horns of a snail, and point from every part of the body, serving at once as legs to move on, as arms to feel with, and as instruments of capture and defence. Between these horns it has spines not endued with such a share of motion. The spines are hard and prickly; the horns soft, longer than the spines, and hid at the bases of the spines. This apparatus is only seen when the animal is hunting its prey at the bottom of the water; for, a few minutes after it is taken, all the horns are withdrawn into the body, and most of the spines drop off. Furnished with two thousand spines, and twelve hundred horns, all serving for legs, and from their number seeming to impede each other's motion, yet it runs not without swiftness at the bottom, and it is sometimes not easy to overtake it. It is often taken on the ebb, by following it in shallow water, either in an ozier basket, or simply with the hand. Both the spines and the horns assist its motion; and the animal is usually seen running with the mouth downward.

Some kinds are as good eating as the lobster; their eggs, which are of a deep red, are considered as a very great delicacy. Of others the taste is but indifferent; and in all places, except the Mediterranean, they are little sought for, except as objects of curiosity.

The Acorn Shell-fish, the Thumb-footed Shell-fish, and the Barnacle, are fixed to one spot, and appear to vegetate from a stalk like a kind of fungus, growing in the deep, destitute of animal life as well as motion:

but the animal residing within the shell has not only life, but some degree of voraciousness; it has a cover to open and shut its shell at pleasure, and twelve long crooked arms, furnished with hair, which it thrusts forth for its prey, and eight smaller, which are generally kept in the shell. They are found adhering to every substance in the ocean; rocks, roots of trees, ships' bottoms, whales, lobsters, and even crabs, like bunches of grapes clung to each other. It is amusing enough to behold their operations: when the sea is calm, they are seen opening the lid, and peeping about them; they then thrust out their long neck, look round them for some time, and then abruptly retreat back into their box, shut their lid, and lurk in darkness and security. Some people eat them.

Of all the shelly tribe, the PHOLADES are the most wonderful. They are found in different places; sometimes in their proper shell, at the bottom of the water; sometimes concealed in lumps of marly earth; sometimes lodged, shell and all, in the body of the hardest marble. In their proper shell they assume different figures; but, in general, they somewhat resemble a mussel, except that their shell is composed of five or more pieces, the smaller serving to close the openings left by the irregular meeting of the two principal.

This animal, when divested of its shell, is roundish and soft, with two teeth, but placed so as to be incapable of touching the hollow surface of its stony dwelling. It has two covers to its shell, that open and shut at either end; but the instrument with which it performs its operations, and buries itself in the hardest rocks, is a broad fleshy substance, somewhat resembling a tongue, issuing from the bottom of its shell. With this soft yielding instrument, it perforates the most solid marbles: and having, while yet little and young, made its way by a very narrow entrance into the substance of the stone, when it begins to grow bigger, it enlarges the apartment. By slow successive applications, it effects what other animals are incapable of performing by force; such is the power of persevering patience. While yet naked and very small, it has effected an entrance, and buried its body in the stone: it there continues for life at its ease. The sea-water that enters the aperture supplying it with plenty, it quickly grows larger, and finds a necessity of enlarging its habitation and its shell; in proportion as it becomes larger, it makes its way farther into the rock: when it has got a certain way in, it hollows downward, till its habitation, when completed, resembles the bowl of a tobacco-pipe; the hole in the shank being that by which the animal entered. Thus immured, the Pholas lives in darkness, indolence, and
plenty,

plenty, never removing from its narrow mansion ; the sea-water that enters by its little gallery satisfies its wants, and, without any other food, it grows from seven to eight inches long, and thick in proportion. Their shell grows on them in the body of the rock. These shells take different forms, and are composed of a different number of valves, from three to twelve ; sometimes the shell resembles a tube, with a hole at each end, one for the mouth, and the other for voiding the excrements. Many often meet in the heart of the rock, and frequently break in on each other's retreats. Whether by accident, or of choice, cannot be determined ; they are most commonly found in numbers in the same rock ; and sometimes above twenty within a few inches of each other.

Plants, which are found in the same place, are also very common. The leaves of the mulberry tree are very large, and are of a dark green color. The bark of the tree is very smooth, and is of a light brown color. The wood of the tree is very hard, and is of a light brown color. The fruit of the tree is very small, and is of a dark brown color. The leaves of the tree are very large, and are of a dark green color. The bark of the tree is very smooth, and is of a light brown color. The wood of the tree is very hard, and is of a light brown color. The fruit of the tree is very small, and is of a dark brown color.

SURVEYS OF NATURE.

PART THE SIXTH.

I N S E C T S.

INSECTS are a subject almost inexhaustible from numbers and variety. "After an attentive examination," says Swammerdam, "of the nature and anatomy of the smallest as well as the largest animals, I cannot help allowing the least an equal, or perhaps a superior, degree of dignity. If, while we dissect with care the larger animals, we are filled with wonder at the elegant disposition of their parts, to what an height is our astonishment raised, when we discover all these parts arranged in the least in the same regular manner!" Yet the insect tribe deserve but the last and lowest rank in animated nature; they seem all the most imperfectly formed; many of them can live a long time, though deprived of organs necessary to life in higher ranks of nature. They are too often, among ourselves, unwelcome intruders on the fruits of human industry; but in less cultivated regions, their annoyance and devastations are terrible. Witness Lapland and America, where, if a candle be lighted, the insect swarm instantly extinguishes it with their numbers; where the inhabitants are obliged to smear their bodies and faces with tar, or grease, to protect them from the puncture of their minute enemies; where, though millions are destroyed, famished millions still succeed to make the torture endless!

Through all nature, nobler animals are slowly produced, while meaner births are lavished in profusion. Of all productions in nature, insects are the most numerous. On minute inspection, we shall find every plant supporting

supporting a number of scarce perceptible creatures, that fill up the various stages of youth, vigour, and age, in the compass of a few days existence. Insects have but one invariable method of operating; no arts can turn their instincts; and generally their life is too short for instruction, as a single season often terminates it. Many are attached to one vegetable, or a single leaf; they increase with the flourishing plant, and die as it decays; a few days fill up the measure of their lives: the ends of their production, or its pleasures, are utterly unknown to us.

Insects are little animals without red blood, bones or cartilages, furnished with a trunk, or else a mouth, opening lengthwise, with eyes which they are incapable of covering, and with lungs which have their openings on the sides. Almost every species has its distinct history, and exhibits manners and appetites peculiarly its own; generally prolific beyond computation, and multiplied beyond description.

To enumerate every species of flies, or moths, would be fruitless; to give an history, utterly impracticable. Mr. Ray thought there could not be less than twenty thousand kinds; and one gentleman of my acquaintance, himself, caught eight hundred in one season in England; yet possessed very far from a majority of our natural tribes. When roused from their state of annual torpidity, and beginning to feel the genial influence of spring, they exhibit new life in every part of nature.

By selecting some similitudes in propagation, manners, or form, we derive a hint for grouping several in one description, and thus shorten the labour of their history. The first that offer are those without wings, crawling on every plant and spot of earth. Of these, some never obtain wings; others only wait their growing wings, to arrive at perfection.

The former may be considered as the *first* class of insects. All these, the flea and the wood-louse excepted, are produced from an egg, and suffer no further change of form, but continue to grow larger till they die.

The second order, when produced from the egg, have their wings cased up so as not to appear. This, however, does not prevent the animal's running, leaping, and moving with celerity; but when the case bursts, and the wings expand, all its motions become more extensive and perfect.

The third order of insects is the moth and butterfly kind. These have four wings, covered with a mealy substance of various colours, which when handled comes off on the fingers; and, if examined by the microscope, appears like scales or feathers, with which the wing is nicely embroidered. They are first hatched from an egg, in the form of a caterpillar

pillar that eats, and often casts its skin, of which when divested for the last time, it assumes a new covering, called a chrysalis (or the cone in the silk-worm), in which it continues hidden till it comes forth a perfect moth or butterfly.

The fourth order is those winged insects which come from a worm, not a caterpillar, yet go through changes similar to those of moths and butterflies. They quit the egg as a worm, then become a chrysalis; in some, their wings and legs are seen; in others, the animal is detached from the cone which conceals it; but all break their prison, and come out perfect winged animals; some with two wings, some with four. The wings of these differ from those of the butterfly and moth kind, by not having mealy scales. In this class we may place the numerous tribes of gnats, beetles, bees, and flies.

After Insects follow a numerous tribe, that may be propagated by dissection. Some, though cut into an hundred parts, retain such life in each, that every part shortly becomes a perfect animal. They seem placed between animals and vegetables, and to connect animated and insensible nature. To this class belong the earth-worm, the sea-nettle, and the polypus. These are not properly insects; but seem with propriety to follow them, in the general order of nature.

WINGLESS INSECTS.

IN general, all animals resembling the flea, the louse, the spider, the bug, the wood-louse, the water-louse, and the scorpion, never acquire wings, but are produced from the egg in that form which they never change.

This class is, in general, longer lived than others, often continuing their term beyond one season, which is the ordinary period of insect existence. They seem also less subject to the influence of the weather, and often endure winter without torpidity. Sometimes the young burst the shell within the parent's body, and are brought forth alive. This is not unfrequent with the wood-louse, and others, which sometimes produce eggs, sometimes young perfectly formed.

These creatures often, during their existence, change their skin, in common with many animals. Their skins, if compared to their strength

and size, resemble the shell of a lobster, and adequately defend them from injuries, particularly from the attacks of each other. Within this they grow, till their size exceeds that of their covering, then it bursts, and they acquire one more proportionate. Their strength is, for their size, almost beyond credibility. A flea will draw a chain an hundred times heavier than itself, as it will also eat ten times its own size of provision in a day.

T H E S P I D E R.

FORMED for rapacity, and living only on insect food, all its habits are calculated to deceive and surprise; it spreads toils to entangle its prey; is endued with patience to await its coming; and has arms and strength to destroy it when ensnared.

The house-spider, which weaves its web in neglected rooms; the garden-spider, that spreads its toils from tree to tree, and rests in the centre; the wandering-spider, that has no settled abode; and the field-spider, that is sometimes seen mounting, web and all, into the clouds, are the chief of our native spiders, and, though reputed venomous, are inoffensive. But in Africa and America, in regions where all insects acquire their greatest growth, where the butterfly expands a wing like our sparrow's, and the ant builds habitations as tall as a man, their spiders bear a proportionable magnitude. The Martinico spider's body equals a hen's egg, and is covered with hair. Its web is strong, and its bite dangerous.

Spiders have two divisions in the body. The fore part, containing the head and breast, separated from the hinder part or belly by a slender thread, through which is a communication from one part to the other. The fore part is covered with a hard shell, as also the legs, which unite to the breast. The hinder part has a supple skin, beset with hair. They have several eyes round the head, brilliant and acute, sometimes eight, sometimes six; two behind, two before, the rest on each side. Their eyes are immoveable, and want eye-lids. They have two pincers on the fore part of the head, rough, with strong points, toothed like a saw, and terminating in claws; near the point of the claw, a small hole emits a poison,

poison, harmless to us, yet capable of instantly destroying its prey. This is their most powerful weapon; they can open these pincers as occasion requires; when undisturbed, they lie one upon the other. They have eight legs, jointed like those of lobsters: if a leg be torn away, or a joint cut off, a new one will quickly grow in its place. At the end of each leg are three crooked moveable claws; a small one, placed high up like a cock's spur, by which it adheres to the threads of its web; and two others, larger, which meet like a lobster's claw, with which they can hold by the smallest depressions of very polished surfaces imperceptible to us. But when they walk on bodies perfectly smooth, as looking-glass or polished marble, they squeeze a little sponge, placed near the extremity of their claws, and diffusing a glutinous substance, adhere to the surface. They have two other legs, or rather arms, used in holding and managing their prey.

The spider's web is generally laid where flies are most apt to come and shelter; in the corners of rooms, round the edges of windows, in the open air among the branches of trees: here the spider remains days or weeks together, in patient expectation, seldom changing its situation, though never so unsuccessful. To make the web, nature has given this animal a large quantity of glutinous matter within its body, and five ducts or teats for spinning it into thread. This substance is contained in a little bag, and at first sight resembles soft glue; examined more accurately, it appears twisted into many coils of an agate colour; on breaking it, the contents may be easily drawn out into threads, from the tenacity of the substance, not from threads being already formed. The threads which we see, and appear so fine, are composed of five joined together, and these many times doubled to form the web.

When a HOUSE-SPIDER begins a web, having chosen some commodious spot, it distils one little drop of its glutinous liquor, which is very tenacious; then creeping up the wall, and joining its thread as it proceeds, it darts itself in a very surprising manner to an opposite point, where the other end of the web is to be fastened; this thread drawn tight and fixed, the spider runs on it backward and forward, assiduously doubling and strengthening it. The spider makes a number of threads parallel to the first; and crosses them with others; the clammy substance of which they are formed binding them, when newly made, to each other. The insect after this doubles and trebles the thread that borders its web, and secures the edges. The retreat is next attended to; this is formed like a funnel, at the bottom of the web, for concealment, having two passages,

or outlets, one above, the other below; contrived to permit excursions, at proper seasons, for prying into every corner, and cleaning parts which are clogged or encumbered. Ever attentive to its web, the spider, from time to time, cleans away dust that gathers round it, giving the whole a shake with its paws; but not to endanger the fabric. Whenever this web is touched, the spider prepares for attack or defence. If the insect impinging be a fly, it springs forward with great agility; if it be an enemy stronger than itself, it keeps within its fortress till the danger be over. This retreat also serves for a place where the creature can feast upon its game in safety. Often the labours of an age are destroyed in a minute, and the spider is obliged to remain spectator of universal ruin. Of the glutinous substance of which the web is made, in this calamity, it either makes a new web, or patches up the old one. There is originally but a certain quantity of this matter, which, when exhausted, nothing can renew. When this reservoir is dried up, the animal is left to the chances of necessity. An old spider is thus frequently reduced to the greatest extremity; it hunts about for the web of another, younger and weaker, which is driven out to make a new web, and the old one remains in possession of its labours. If unable to acquire a web, it endeavours for a while to subsist on accidental depredation; but in two or three months inevitably dies of hunger.

The GARDEN-SPIDER spins a great quantity of thread, which floating in the air in various directions, from its glutinous quality, at last sticks to some object, a lofty plant or the branch of a tree. The spider draws the line thus fixed, and passing and repassing on it, strengthens the thread. From the first cord the spider fastens another, dropping from thence to some solid body below, then climbs up again and begins a third, which it fastens by the same contrivance, and so on. When the young spider begins spinning, its web is buoyant, and not only the thread floats in the air, but the little spinster is supported by its buoyancy.

A spider sometimes remains weeks or months watching without catching a single fly, and is surprisingly patient of hunger. The butterfly, or the hornet, when they touch the web, fly off again, and the spider seems not displeased at their retreat. The large blue-bottle-fly, the ichneumon-fly, and the common meat-fly, seem to be its favourite game. When one of these strikes into the toils, the spider is instantly seen alert and watchful at the mouth of its hole, observing whether the fly be completely immeshed. If he be, the spider walks leisurely forward, seizes its prey, and instantly kills it by instilling a venomous juice into the wound,

If the fly be not entirely immeshed, the spider waits, without appearing, till its prey has fatigued itself by its struggles. If the spider has fasted long, it drags the fly to its hole and devours it; but if not pressed by hunger, it gives the fly two or three turns in its web, completely to immesh it, and there leaves it for a future feast.

The males are much less than the females; having parts of generation placed in the fore arms, as if bursting out from the points of his fore feet. Their receptacle is beneath the body of the female. She generally lays from nine hundred to a thousand eggs in a season; blueish, speckled with black, separated from each other by a glutinous substance; not unlike frog-spawn water. Some are as large as a grain of mustard-seed; others scarcely visible. She never lays till two years old. When her eggs have remained an hour or two to dry, she prepares them a bag by spinning a web four or five times stronger than that for catching flies, and lined within by a down from her breast. This bag is as thick as paper, smooth within, rough without. Within this they deposit their eggs. They stick it by the glutinous fluid to the end of their body; so that the animal appears as if she had one body behind another. If this bag be separated from her, she employs all her assiduity to stick it again in its former situation, and seldom abandons her treasure but with her life. When the young are excluded from their shells, within the bag, they remain some time in their confinement, till the female, instinctively knowing their maturity, bites open their prison, and sets them free. She receives them on her back for some time, until they have strength to provide for themselves. They begin to spin when scarce discernible, and to prepare for a life of plunder. They are able to destroy animals ten times bigger than themselves, and they quickly recover of wounds.

Spiders are enemies of each other; they are of such a malignant nature, they cannot live in society, but, instead of their food, devour each other.

Of this animal are several kinds, slightly differing from each other, either in habits or conformation. The WATER-SPIDER is the most remarkable. This insect resembles the common spider, except that its hinder part is rather the shape of a nine-pin than a ball. They differ, by living both by land and water, and spinning in both elements. Their appearance under water is remarkable; they inhabit the bottom, yet are never touched by the element in which they reside, but are enclosed in a bubble of air that surrounds them. This bubble has the bright appearance of quicksilver; within this they continue eating, spinning, and sleeping,

sleeping, without its bursting, or disturbing their operations : sometimes the bubble is divided into three apartments, and in the spring the male enters one of those to the female ; the bubble in which he was contained unites with the other, like two drops of water, when closely approached. They spin their webs as well in the water as on land ; and most probably they feed on the small insects of both elements.

The celebrated TARANTULA deserves notice as the largest of the spider kind known in Europe. Is native of Apuleia in Italy ; its body three quarters of an inch long, about as thick as one's little finger ; colour generally olive-brown, variegated dusky ; has eight legs and eight eyes ; nippers, sharp and serrated : between these and the fore legs are two little horns, or feelers, which it moves very briskly when approaching its prey. It is covered all over the body with a soft down ; and propagates by laying eggs. In the summer months, particularly in the dog-days, the tarantula creeping among the corn, bites the mowers and passengers ; but in winter it lurks in holes, and is seldom seen. Though the bite is attended with no *dangerous* symptoms, and will easily cure of itself, wonderful stories are reported concerning its virulence, which has been said to yield only to the influence of music and dancing. Some have thought such exercise might promote perspiration, and so the cure ; while others insist the disease requires no curing, being in reality nothing more than a *craving* for the contributions usually levied on passengers or bye-standers who happen to be present.

T H E F L E A.

THIS insect, the enemy of mankind, also of the dog, cat, and several other animals, is found in every part of the world, but bites with greater severity in some countries than in others. Its numbers in Italy and France are much greater than in England.

It has a small head, large eyes, and a roundish body. It has two feelers, or horns, short, composed of four joints ; between these lies its trunk, which it buries in the skin, and through which it sucks blood. The body is covered with a suit of polished armour neatly jointed, beset with many sharp prickles. It has six legs, whose joints are so adapted, that it can,

as

The Flea.

magnified

as it were, fold them up one within another ; in leaping, they all spring at once, whereby its whole strength is exerted, and the body raised above two hundred times its own diameter.

Fleas are at first a sort of nits or eggs, round and smooth ; from these proceed white worms, of a shining pearl colour : in a fortnight they are a tolerable size, very lively and active. If touched, they roll themselves up in a ball ; soon after they begin to creep, and seek a place to lie hid in, where they spin a silken thread from their mouth, and with this inclose themselves in a small round bag or case, white within, but dirty without : here they continue a fortnight, and burst from this confinement perfectly formed.

T H E L O U S E.

IN examining the human louse with the microscope, its deformity strikes us with disgust : the fore-part of the head is oblong, the hind-part somewhat round ; the skin hard, and, being stretched, transparent, with here and there several bristly hairs ; in the fore-part is a proboscis or sucker ; on each side the head are antennæ, or horns, each divided into five joints, covered with bristly hair ; and several white vessels are seen through these horns ; behind these are the eyes, which seem to want those divisions observable in other insects, and appear encompassed with some few hairs ; the neck is very short, the breast divided into three parts ; on each side are six legs, consisting of six joints, covered with bristly hairs ; the ends of the legs are armed with two smaller and larger ruddy claws, serving those insects as a finger and thumb, by which they catch hold of objects ; the end of the body terminates in a cloven tail ; the sides are all over hairy ; the whole resembling clear parchment, and, when roughly pressed, cracking with a noise. On a closer view, its white veins, and other internal parts, appear ; as likewise a most wonderful motion in its intestines, from the transparency of its external covering. When the louse feeds, the blood is seen to rush, like a torrent, into the stomach ; and its greediness is so great, that the excrements contained in the intestines are ejected at the same time, to make room for this new supply. The louse has neither beak, teeth, nor mouth, as Dr. Hooke

described it, but a proboscis or trunk, or pointed hollow sucker, with which it pierces the skin, and sucks the blood only. The stomach is lodged partly in the breast and back; but most of it in the abdomen. When swollen with blood, it appears dark brown, visible through the skin; and is either a faint red, or a full or bright brown; as the contents of the stomach are more or less changed. When it is empty, it is colourless; but when filled it is plainly discernible, and its motion very extraordinary, working with very strong agitations, the old aliment mixing with the new. If kept fasting two or three days, and placed on the back of the hand, it will immediately seek for food; the more readily, if the hand be rubbed till it grows red. The animal then turns its head to the skin, and diligently searches for some pore; when found, it fixes the trunk therein, and soon the microscope discovers the blood ascending through the head, in a very rapid, and even frightful stream. The louse has at that time sufficient appetite to feed in any posture; it is then seen sucking with its head downward, and its tail elevated. If, during this operation, the skin be drawn tight, the trunk is bound fast, and the animal is incapable of disengaging itself; but it more frequently suffers from its gluttony, since it gorges to such a degree, that it is crushed to pieces by the slightest impression.

Swammerdam is inclined to think them hermaphrodites, having found an ovary in not less than forty-two. In one were found ten large eggs, and forty-four smaller. Scarce any animal multiplies so fast as this unwelcome intruder. The moment the nit gets rid of its superfluous moisture, and throws off its shell, it begins to breed in turn. Nothing so much prevents their increase as cold dryness: the nits must be laid warm and moderately moist to produce any thing. Linnæus is of opinion, that the head and the body louse differ in no respect from each other. They seldom attack any in our climate, but such as from sloth or famine invite their company.

It would be endless to describe the various tribes, under this name, that swarm on every part of nature; scarce an animal, or vegetable, that does not suffer from its own peculiar louse. The sheep, the horse, the hog, and the elephant; the whale, the shark, the salmon, and the lobster; every hot-house and every garden is infested with some. Linnæus once found a vegetable louse on some plants newly arrived from America: willing to trace the little animal through its various stages, he brought it with him from London to Leyden, where it became the parent of so numerous a progeny, that it soon over-run all the physic-garden of that beautiful city.

That which some have called the **LEAF-LOUSE**, is the size of a flea; bright green, or blueish green colour; the body nearly oval, largest and most convex on the hinder part; the breast very small, the head blunt and green; the eyes are prominent on the fore-part of the head, of a shining black; near these, is a black line on each side; the legs are very slender. These are usually found on the leaves of the orache, and other plants; and the weaker the leaves and buds, these insects swarm in greater abundance. Some plants are covered over with them. They do not cause the plant's weakness, but by wounding and sucking the leaf they increase the disease. They generally assume their colour from the plant on which they reside. Those on pot-herbs and plum-trees, are ash-coloured, but greenish when young; those of the alder and cherry tree, are black, also those on beans and some other plants; those on the leaves of apples and rose-trees, are white: as these leap like grasshoppers, some place them in the number of the flea kind. The most uncommon colour is reddish, and this sort is found on the leaves of tansey; and their juice, when rubbed on the hands, tinges them red. All these live on their respective plant, and are often engendered within the very substance of the leaf.

These bring forth their young alive; their fore-parts being excluded first. Its provision lying beneath it, during summer it eats and creeps with great agility: for winter it endeavours to secure a retreat near trees or plants that nourish it in spring. They never hide in the earth, because they have no part fitted to remove earth; nor can they creep into every chink, as their legs are long, and their bodies so tender, the least rough particle of earth would hurt them; but they get into the deep chinks of the bark, and the cavities of stronger stalks. As neither the temperature of autumn nor spring hurts them, they seldom seek hiding-places before the fall of the leaf, and take the earliest advantage of returning warmth. They cast their skins four times; the males have four wings, the females none. They have long legs, to creep over the long hairs of plants and leaves, or to travel from tree to tree when distant. Their trunk or snout lies under the breast; this they thrust into the pores of the plant, and suck out the juice; but so hurt the leaves by sucking, that they become spotted and scabbed, their edges always turning up. The leaf-louse is more than a match for the ant at single combat. When they perceive the ant approaching behind them, they kick back with their hinder feet, and drive off the invader, as a horse would a lion.

The three principal and constant enemies to these insects are, first, the

fire-fly, which lays its eggs where these insects are in greatest number, which produce worms, that seize and devour all the leaf-lice that come near : another enemy is the worm of a peculiar kind of beetle, which destroys them in great numbers ; but the most formidable is the ichneumon fly, that seizes one of the largest females, and lays its egg on her ; this is hatched into a worm, which soon devours and destroys the animal from whose body it sprung.

T H E B U G

CONTRIVES its habitation with much art, seems to avoid the light with great cunning, and if candles be kept burning will not issue from its hiding place ; but when darkness promises security, it issues from every corner, drops from the tester, crawls from behind the arras, and travels with great assiduity to the unhappy patient, who vainly wishes for rest and refreshment. Not less disagreeable from their nauseous stench, than their unceasing appetites : when they crawl, the whole bed is infected ; but, if accidentally killed, it is insupportable. In Great-Britain they multiply less than on the Continent. In France and Italy the beds, particularly in their inns, swarm with them, as doth every piece of furniture. They grow larger also, and bite more cruelly.

This animal consists of three principal parts ; the head, the corselet, and the belly ; has two brown eyes, very small, and a little prominent ; and two feelers, with three joints : underneath these is a crooked trunk, which lies close on the breast. The breast is a kind of ring, in which are the two first pair of legs. The belly consists of nine rings, under which are two pair of legs more. Each leg has three joints, forming the thigh, leg, and foot, which is armed with a crooked claw, like a hook. The body is smooth, except a few short hairs about the vent, and on the two last rings. Its motion is slow and unwieldy ; but its sight exquisite. This insect internally has the great artery, which as in all insects performs the functions of the heart ; apertures of the lungs on the right side and left, through which it breathes ; a stomach and intestines.

The male and female are plainly distinguishable. The female has an ovary filled with eggs, joined together like a bunch of grapes ; each egg
being

being oblong, almost cylindrical, inclining to white, and pretty transparent. In about two days after impregnation, she deposits about an hundred and fifty eggs; they continue some months; during which time, neither cold nor heat, moisture nor fumigation, can in the least retard their exclusion. It is this hardness in the shell that seems to continue the breed; as the old ones die every winter, or are easily destroyed by fumigation. Cleanliness is the best antidote to these nauseous insects. They are sometimes found in such numbers among old furniture, and neglected chambers, exposed to the south, that, wanting other sustenance, they devour each other. They are also enemies to other vermin, and destroy fleas very effectually.

Of the bug kind Linnæus reckons forty.

THE WOOD-LOUSE

IS seldom above half an inch long, and a quarter of an inch broad; colour livid black, when found about dunghills and on the ground; but those under tiles, and in drier places, are of a dun colour. It has fourteen feet, seven on each side; only one joint each, which is scarcely perceivable. It has two short feelers; the body is oval. When touched, it rolls itself into a sort of ball; the sides, near the feet, are dentated; found among rotten timber and decayed trees: in winter, lies hid in crevices of walls and buildings. The male is distinguishable from the female, being less, and more slender; her eggs are white and shining like seed pearls, and very numerous: properly speaking, although the young when excluded have the appearance of an egg, yet they are alive, and, without throwing off any shell, stir and move about; so that this animal may properly be said to be viviparous. The little worms at first seem scarce able to stir; but soon feed, and become very brisk. These animals are of great use in medicine; being impregnated with a saline quality, which is diuretic and stimulating.

Of this insect Linnæus makes three species.

THE MONOCULUS, OR ARBORESCENT WATER-FLEA,

IS the size of a flea; appears to the sight to have but one eye; for, by the smallness of the head, the eyes seem joined to each other: they are situated in the trunk, and appear, by the microscope, to be reticulated, or net-like; the trunk is not only small and sharp, but transparent. The insects are blood-red; sometimes in such multitudes on the surface of standing water, as to make it appear red; whence fanciful people have thought the water to be turned into blood.

This animal's branching arms, and their motion in the water, deserve attention. By these it can move in a straight line; waving them, as a bird its wings, sometimes upward, sometimes downward, sometimes to the right, sometimes to the left. By striking the water with these, it ascends with great velocity; by striking in a contrary direction, it dives with equal ease. As these motions are very rapid, the little animal appears to jump in the water, its head always tending to the surface, and its tail stretched downward. This insect is produced from an egg, which, when excluded, is carried on the back of the female, and soon is seen floating in the water round her. Its appearance at first is that of a very small whitish insect, endued with a very nimble motion. Except in colour, it suffers no change, only continuing to grow larger and redder, as it grows old. They sometimes remain several days on the surface of the water; and sometimes are seen at the bottom only; but never at rest. They change their skin, like most other insects; and the cast skin resembles the insect itself so exactly, that one might mistake the mask for the animal.

T H E S C O R P I O N,

WHOSE shape is hideous, whose size enormous, and whose sting fatal, is entirely a stranger among us. In several parts of the Continent of Europe it is but too well known, though seldom above four inches long: in the tropical climates, it is seen a foot in length, and in size equals a lobster. It is also more eminently poisonous and fatal.

The Scorpion

Not less terrible from its size than its malignity. It resembles a lobster somewhat in shape. There are counted nine kinds of this dangerous insect, chiefly distinguished by their colour; yellow, brown, and ash-coloured, rust-coloured, green, pale yellow, black, claret-colour, white, and grey.

There are four principal parts distinguishable in this animal; the head, the breast, the belly, and the tail. The scorpion's head seems jointed to the breast; in the middle of which are two eyes; and a little forwarder two more, placed in the fore part of the head, so small, they are scarcely perceivable. The mouth has two jaws; the undermost divided, and the parts notched into each other, which serve as teeth; these can, at pleasure, be withdrawn into its mouth, so that no part can be seen. On each side the head are two arms, each composed of four joints; the last large, with strong muscles, and like a lobster's claw. Below the breast are eight articulated legs, each divided into six joints, having two crooked claws, and here and there covered with hair. The belly is divided into seven little rings; from the lowest of which is continued a tail, composed of six joints, bristly; the last armed with a crooked sting, long, pointed, hard, and hollow; pierced near the base by two small holes, through which the animal ejects a drop of poison, white, caustic, and fatal. The reservoir of this poison is a small bladder near the tail, into which the venom is distilled by a peculiar apparatus. If this bladder be gently pressed, the venom will be seen issuing out through the two holes above-mentioned.

Few animals are more formidable, or more truly mischievous. As it takes refuge in small places, and generally in houses; it must almost inevitably sting some among whom it resides. In some parts of Italy and France, in the province of Languedoc, it is one of the greatest pests; but its malignity in Europe is trifling, when compared to those of Africa and the East. In Batavia they grow twelve inches long; there is no removing any furniture without the utmost danger. Along the Gold Coast they are equally large, and their sting fatal.

No animal in the creation seems endued with such an irascible nature. When taken, they exert their rage against the sides of the glass vessel containing them. They will attempt to sting a stick when put near them; and attack a mouse or a frog, while those animals were far from offering any injury. Maupertuis put three scorpions and a mouse into the same vessel together, and they soon stung the little animal in different places. The mouse stood for some time on the defensive, and at last

killed them all, one after another. He tried this experiment in order to see whether the mouse, after it had killed, would eat the scorpions; but the little quadrupede seemed entirely satisfied with the victory, and even survived the severity of its wounds. Wolkamer tried the courage of the scorpion against the large spider, which at first used all its efforts to immesh the scorpion in its web, which it immediately began spinning; but the scorpion rescued itself from the danger, by stinging its adversary to death: it soon after cut off, with its claws, all the legs of the spider, and then sucked all the internal parts at its leisure.

The fierce spirit of this animal is equally dangerous to its own species. Maupertuis put an hundred of them together in the same glass; and they scarce came into contact, when they began to exert all their rage in mutual destruction: there was nothing to be seen but one universal carnage, without distinction of age or sex; so that, in a few days, there remained only fourteen, which had killed and devoured all the rest. When driven to extremity, the scorpion will destroy itself. If placed amidst a circle of burning charcoal, and thus an egress prevented on every side, the scorpion runs round the circle in hopes of escaping; but finding that impossible, stings itself on the back of the head, and instantly expires.

The male and female are easily distinguishable; the male being smaller and less hairy. The female brings forth her young alive and perfect, thirty or forty at a time. How long they live we are not told; but probably seven or eight years; and the larger kind double that duration. They cast their shell, or skin, which is softer by far than the lobster's, and set with hairs in abundance, particularly at the joinings. The young lie in the parent, each covered up in its own membrane, and united to each other by an oblong thread, in the form of a chaplet.

There is an American scorpion, produced from eggs no larger than pins points, and deposited in a web, which they spin from their bodies, and carry about with them till they are hatched. As soon as the young are excluded from the shell, they get on the back of the parent, who turns her tail over them, and defends them with her sting.

THE SCOLOPENDRA AND GALLY-WORM.

THE SCOLOPENDRA, or CENTIPES, having many feet, is very common in many parts of the world, especially between the tropics. In the East-Indies they grow to six inches long (ours are but one inch), of a ruddy colour, as thick as a man's finger : they consist of many joints, and from each joint a leg on each side : they are hairy, and seem to have no eyes, but two feelers on the head, by which they find out their way. The head is very round, with two small sharp teeth, with which they inflict wounds that are very painful and dangerous. Of this animal there are different kinds ; some living, like worms, in holes in the earth ; others under stones and among rotten wood ; so that nothing is more dangerous than removing those substances, in places where they breed.

The GALLY-WORM differs from the Scolopendra in having double the number of feet, there being two on each side to every joint of the body. Some are smooth, and others hairy ; some yellow, some black, and some brown. Are found among decayed trees, between the wood and the bark ; also among stones covered with moss. When touched, contract themselves, rolling themselves up like a ball. Whatever be their qualities in the tropical parts of the world, in Europe they are perfectly harmless. These are supposed to be produced perfect from the parent or the egg. They are seen of all sizes ; and this is sufficient inducement to suppose that they preserve their first appearance. It is probable, however, that, like most of this class, they often change their skins ; but of this we have no certain information.

THE

SECOND ORDER OF INSECTS.

TO this we refer the Libella, or Dragon-Fly; the Formica-Leo, or Lion-Ant; the Grasshopper; the Locust; the Cricket; the Wood-Cricket; the Mole-Cricket; the Flea-Locust; the Flying-Bug; the Tipula; the Water-Scorpion; the Notonecta, or Water-Fly; and many others, produced by eggs, but without wings, which they afterwards acquire.

THE LIBELLA, OR DRAGON-FLY,

IS, of all the flies which diversify Nature, the most various and most beautiful; of all colours; green, blue, crimson, scarlet, white; some unite variety of most vivid tints, in different shades. They are called, in different parts, by different names. They are distinguished from all other flies by the length of their bodies, the largeness of their eyes, and the beautiful transparency of their wings, which are four. In summer they fly rapidly near every hedge, and by every running brook; they sometimes settle on the leaves of plants, and sometimes keep hours together on the wing.

Though there are three or four different kinds, yet they agree in the most striking parts of their history. The largest are from two to four inches long; their tail forked; their body divided into eleven rings; their eyes large, horny, transparent, net-like; their wings, that always lie flat when at rest, of a beautiful glossy transparency, sometimes shining like silver or gold. Within the mouth are two teeth, covered with a beautiful lip; with these the creatures bite fiercely when taken; but their bite is harmless.

They are produced from eggs, deposited in the water, where they remain some time without life or motion. They are ejected by the female into the water in clusters, like a bunch of grapes, where they sink to the bottom,

bottom, and continue till the young find strength enough to break the shell, and to separate from each other. They first shew life as a worm, with six legs, bearing a strong resemblance to the dragon-fly in its winged state, except that the wings are yet concealed within a sheath. Their rudiments appear in bunches on the back, within which the wings are folded up into each other, while all the colours and varieties of painting appear through the skin. On quitting the egg, they still continue in the water, where they creep and swim, but not swiftly. They have a sharp sight, and sink to the bottom whenever they perceive unusual objects. Their food is soft mud, and the glutinous earthy substances at the bottom.

When they prepare to change from their reptile to their flying state, they quit the water for a dry place, as grass, pieces of wood, stone, or any thing else they meet with. They there firmly fix their acute claws; and for a short time continue immoveable. The skin first opens on the head and back; out of this opening they exhibit their real head and eyes, and at length their six legs; whilst the empty skin, or slough of their legs, remains firmly fixed in its place. After this, the inclosed creature creeps forward by degrees; drawing first its wings, then its body, out of the skin; and proceeding a little farther, rests for some time, as if immoveable. During this time the wings, which were moist and folded, by degrees expand, and smoothen their plaits, which were laid against each other, like a closed fan. The body is likewise insensibly extended, until the limbs have obtained their proper dimensions. All these surprising and difficult operations are accomplished by the force of the blood and the circulating humours. The creature cannot at first use its new wings, but is forced to stay in the same place till its limbs are dried by the circumambient air. It soon, however, wings the air, and selects the variety of its provisions. Nature has provided it with two large eyes, which make almost the whole head, and which resemble glittering mother of pearl. It has four expansive silver-coloured wings, with which, as with oars, it can turn itself swiftly; and a very long body, which, like a rudder, directs its motions. As the wings are long, and the legs short, they seldom walk, but are ever seen either resting or flying. They always chuse dry branches of trees or shrubs to settle on; and, when refreshed a little, renew their flight.

They are tyrants of the insect tribe; and, like the hawk, only hovering to seize their prey. They are the strongest and most courageous of winged insects. The blue fly, the bee, the wasp, the hornet, and the

the butterfly, are their prey. They spend the whole day in pursuit, and have been seen to devour three times their own size in a single hour. They seize their prey flying, with their six claws, and easily tear it to pieces with their teeth.

The males seek the females with great ardour; their part is placed not at the end of the tail, but under the breast; that of the female lies in the tail. When he finds himself sufficiently near the female, he seizes the back of her head; and fastening his claws upon her, turns his forky tail, which he fastens round her neck, and fixes himself closely and firmly, often for three or four hours. When he flies, she is obliged to fly with him; he still directs the way, and she seems entirely guided by his motion. At last, turning up the end of her tail to his breast, her eggs receive the necessary fecundation. An hour or two after, she flies to some neighbouring pool to deposit her eggs. They continue in a reptile state for a year, and then are changed into a beautiful fly, resembling the parent,

THE FORMICA-LEO, OR LION-ANT,

WHEN it becomes an inhabitant of air, resembles that already described; its glossy wings, its voracious appetites, its manner of generation, are the same. In its reptile state it differs.

THE LION-ANT, in its reptile state, is the size of a common wood-louse, but somewhat broader; has a long head, and a roundish body, narrow towards the tail; colour, dirty-grey, speckled with black; the body composed of several flat rings, which slip one upon another. It has six feet, four fixed to the breast, and two to the neck. The head is small and flat, and has two little smooth horns and feelers, hard, about a quarter of an inch long, crooked at the ends: at their basis are two small black lively eyes, by which it can see the smallest object, as is easily discovered by its starting from every thing that approaches.

This animal possesses the most ravenous appetites in nature. Its legs only enable it to run backward; so that, be it never so famished and rapacious (as it ever seems) its prey must come to it, or rather into its snares. It chuses a dry sandy place, at the foot of a wall, or under some shelter,

to preserve its labours from rain. A heavy clogged earth would defeat its labour. When it commences the hole for its trap, it bends the hinder part of its body, which is pointed, and works backward, making a circular furrow ; within this first it digs a second, a third, and others always less than the preceding. Then it begins to deepen its hole, sinking it lower and lower in the sand, which it throws with its horns, or feelers, toward the edges. This hole is always a circle, and resembles an inverted funnel. When this insect is quite young, its first pit is very small ; as it grows, it makes a larger. It is generally two inches deep, and as much in diameter. The insidious insect places itself in ambush, hiding in the bottom under the sand, so that its two horns encircle the bottom of the pit. The sides of this pit-fall are made of the most loose and crumbling materials ; so that scarce any insect can climb up, that has once got down to the bottom. If then an ant, a wood-louse, or small caterpillar walk too near the edge of this precipice, the sand gives way beneath them, and they fall to the bottom to inevitable destruction. The fall of a single grain of sand gives notice at the bottom, and the murderer never fails to sally forth to seize its prey. If the ant or wood-louse is too nimble, and runs up the sides of the pit-fall, the lion-ant, by means of its broad head and feelers, throws up a shower of sand, which falling on the struggling captive with tremendous weight, once more crushes it down to the bottom ; then no efforts can release it : the lion-ant seizes it with its feelers, which are hollow, and darting them both into its body, sucks out all the little animal's juices with the utmost rapacity. The prey thus reduced to a husk, his next care is to remove the body from its cell, lest its appearance might warn others of danger ; he takes up the wasted trunk with his feelers, and throws it, with wonderful strength, at least six inches from the edge of his hole ; and sets about mending the breaches his fortifications had received in the last engagement. Nothing can abate its industry, its vigilance, its patience, or its rapacity. It will work for a week at its pit-fall ; it will continue on the watch a month, expecting the approach of prey ; and, if it comes in plenty, will quit the insect it has newly killed, to kill another : yet is surprisingly patient of hunger, some having been kept in a box with sand six months without feeding.

When it is to change its form, it quits its usual rapacious habits, but keeps its industry. It furrows up the sand all round irregularly ; testifying those workings and violent agitations which most insects exhibit previous to their transformation. These animals are produced in autumn,

generally live a year, perhaps two, before they assume a winged form. After furrowing up the sand, it hides itself under it, horns and all. It there spins a thread, which being glutinous and humid, sticks to the little particles of sand among which it is spun; and the insect rolls up its web, sand and all, into a ball, about half an inch in diameter, of which itself is the center, and its apartment sufficiently spacious for its motions, composed of silk only, of a fine pearl colour, extremely delicate and beautiful. It seems externally a lump of sand; and thus escapes the search of birds, &c. The insect continues shut up six weeks or two months; and gradually parts with its eyes, its feelers, its feet, and its skin; all which are thrust into a corner of the inner apartment, like a rag. It then appears almost in its winged state, except that a thin skin enwraps the wings, that appears to be a liquor dried on their outside. When its members have acquired the necessary consistence and vigour, it breaks through its enclosure. For this purpose it has two teeth, like those of grasshoppers, with which it eats through till it gets out. Its body, which is turned like a screw, is but a quarter of an inch; but, when unfolded, becomes half an inch in length; its wings, that seemed to occupy the smallest space, in two minutes time become longer than the body. It becomes a large and beautiful fly of the libellula kind; with a long, slender, brown body; small head, large bright eyes, long slender legs, and four large transparent reticulated wings. The rest of its habits resemble that insect whose form it bears; except that, instead of dropping its eggs in the water, it deposits them in the sand.

THE GRASSHOPPER, LOCUST, CICADA, CRICKET. AND MOLE-CRICKET.

THE GRASSHOPPER, that breeds in every meadow, and chirps through the summer, is well known to us; its history relates that of the rest. This animal is the colour of green leaves, except a line of brown which streaks the back, and two pale lines under the belly and behind the legs. It may be divided into the head, the corset, and the belly. The head is oblong, regarding the earth, and bearing some resemblance to that of a horse. Its mouth is covered by a kind of round buckler

buckler jutting over it, and armed with brown teeth; hooked at the points; within the mouth is a large reddish tongue, fixed to the lower jaw. The feelers or horns are very long, tapering off to a point; and the eyes are like two black specks, a little prominent. The corslet is elevated, narrow, armed above and below by two serrated spines. The back is armed with a strong buckler, to which the muscles of the legs are firmly bound; and round these muscles are seen the vessels by which the animal breathes, as white as snow. The last pair of legs are much longer and stronger than the first two pair, fortified by thick muscles, and formed for leaping. It has four wings; the anterior springing from the second pair of legs, the posterior from the third pair. The hinder wings are much finer and more expansive than the foremost, and are the principal instruments of its flight. The belly is large, composed of eight rings, terminated by a forked tail, covered with down. When examined internally, beside the gullet, we discover a small stomach; behind that a very large one, wrinkled and furrowed within; lower down is a third; so that it is not without probability animals of this order are said to chew the cud, as they so much resemble ruminant animals in their internal conformation.

Shortly after the grasshopper assumes its wings, it fills the meadow with its note, which is a call to courtship. The male only is vocal; at the base of the wings is a little hole in its body, covered with a fine transparent membrane. This Linnæus thought to be the instrument it employs in singing; others think the sound is produced by rubbing its hinder legs against each other. The note of one male is seldom heard; but it is answered; and the two little animals, after many mutual insults of this kind, meet and fight desperately. The female is generally the reward of victory; for, after the combat, the male seizes her with his teeth behind the neck, and thus keeps her several hours strongly united.

Towards the end of autumn the female prepares to deposit her burthen; she is greatly distended with eggs, to the number of an hundred and fifty. Nature has furnished her with an instrument at her tail, somewhat resembling a two-edged sword, which she can sheathe and unsheathe: with this she pierces the earth as deep as she is able, and in the hole it has made she deposits her eggs, one after the other. She does not long survive; but, as the winter approaches, dries up and dies. Some assert she is killed by the cold; others, that she is eaten by worms. Neither the male nor female ever survive the winter. The eggs are oval, white, and horny; their size nearly equals anniseed; they

are enveloped by a covering, and crack on being pressed between the fingers: their substance within is a whitish, viscous, and transparent fluid; they remain deposited beneath the earth during winter, till spring begins to hatch them. In May, every egg produces an insect the size of a flea; at first, whitish; after two or three days they turn black; soon after, a reddish brown. They appear from the beginning like grasshoppers wanting wings, and hop among the grass with great agility. The wings are concealed within four little bunches, that seem to deform the sides of the animal, rolled up most curiously in the smallest space. Above twenty days after its exclusion, it prepares for emancipation, ceases from its grassy food, and seeks a convenient place beneath some thorn or thistle, that may protect it from a shower; suffering the same laborious writhings and workings, heavings and palpitations, as other insects. At length, the skin covering the head and breast divides above the neck; the head issues out first from the bursting skin, the other parts follow. Thus disengaged, it appears perfect, but feeble, soft and tender: it may be molded like wax. It is now a greenish white, which becomes more vivid as the moisture on the surface is dried away. Spent and fatigued with its labour for more than an hour together, it shews no sign of life; but the body is drying; and the wings, fold after fold, opening to the sun, at last become longer than the hind legs; the body also is lengthened, and becomes much more beautiful.

These insects are generally vocal in summer, and at sun-setting louder than during the heat of the day. They feed on grass. Unwilling to fly, and slow in flight, particularly when the weather is moist or cool, yet they sometimes fly to considerable distances. If caught by one of the hinder legs, they leave the leg behind them: this does not grow again, but prevents their flying; for, being unable to lift themselves in the air, they have not room on the ground for proper expansion of their wings. If handled roughly, they bite fiercely; and when they fly, make a noise with their wings. They generally keep in the plain, where the grass is luxuriant, and the ground rich and fertile: there they deposit their eggs, particularly in those cracks which are formed by the heat of the sun.

The larger kinds only differ in size, in rapidity of flight, and their powers of injury, by swarming on the productions of the earth. When a swarm of Locusts, two or three miles long, and several yards deep, settle on a field, the consequences are terrible. Though they seldom visit Europe in such dangerous swarms as formerly, yet in some of the southern countries they are still formidable.

The GREAT BROWN LOCUST was seen in several parts of England in 1748, and many dreadful consequences were apprehended from its appearance. This insect is three inches long, and has two feelers an inch in length. The head and horns are brownish; about the mouth blue, as also the inside of the larger legs; the shield on the back greenish; the upper side of the body brown, spotted with black, the under side purple; the upper wings brown, with small dusky spots, a larger at the tips; the under wings transparent, light brown, tinged with green, a dark cloud of spots near the tips. This insect has threatened us often with its visitations; and is truly terrible where it is bred. No animal in the creation multiplies so fast, if the sun be warm, and the soil in which their eggs are deposited dry.

When locusts take the field, we are assured they have a leader whose flight they observe, and pay a strict attention to. They appear, at a distance, like a black cloud, which, as it approaches, gathers on the horizon, and almost hides the light of the day. Often the husbandman sees this imminent calamity pass away, and the whole swarm proceed onward to some less fortunate country: but wretched is the district on which they settle; they ravage the meadow and the arable ground; strip the trees of their leaves, and the garden of its beauty: a few minutes destroy the expectations of a year, and induce famine. In the tropical climates they are not so dreadful as in the southern parts of Europe; for there the power of vegetation is so great, that a small interval repairs the calamity: but our verdure must wait the ensuing spring to repair the damage; besides, in their long flights to these parts, they are famished, and therefore more voracious where they settle. But what they devour is not equal in damage to what they destroy. Their bite is thought to contaminate the plant, and prevent its vegetation. To use the expression of the husbandman, they burn whatever they touch, and leave the marks of their devastation for two or three years ensuing. But, if noxious while living, they are worse when dead; wherever they fall, they infect the air, and the smell is insupportable.

In the year 1690, a cloud of locusts entered Russia in three places, and spread themselves over Poland and Lithuania, in such astonishing multitudes, that the air was darkened, and the earth covered with their numbers. In some places they were seen lying dead, heaped on each other four feet deep; in others, they covered the surface like a black cloth; the trees bent beneath their weight; and the damage which the
country

country sustained exceeded computation. In 1724, Doctor Shaw was a witness in Barbary of their devastations. They first appeared at the end of March, when the wind had been southerly for some time. In April, their numbers were so vastly increased, that in the heat of the day they formed themselves into large swarms, which appeared like clouds, and darkened the sun. In May they disappeared, retiring into the plains to deposit their eggs. In June the young made their appearance, forming many compact bodies of several hundred yards square; which afterwards marching forward, climbed trees, walls, and houses, eating every thing green in their way. The inhabitants, to stop their progress, laid trenches all over their fields and gardens, filling them with water. Some placed large quantities of heath, stubble, and combustible matter, in rows, and set them on fire on the approach of the locusts: but the trenches were quickly filled up, and the fires put out, by the vast number of swarms that succeeded each other. A day or two after one of these was in motion, others just hatched came gleanings after them, gnawing off the young branches, and the very bark of the trees. Having lived near a month in this manner, they arrived at their full growth, and threw off their worm-like state, by casting their skins. To prepare for this change, they fixed their hinder feet to some bush or twig, or corner of a stone; when, by an undulating motion, their heads would first appear, and soon after their bodies. The whole transformation was performed in seven or eight minutes; after which, they were a little while languishing; but when the sun and air had hardened their wings, and dried up their moisture, they returned to their former greediness, with additional strength and agility. After laying their eggs, they directed their course northward, and probably perished in the sea. It is said that the holes these animals make, to deposit their eggs, are four feet deep in the ground; the eggs are about fourscore in number, of the size of caraway comfits, and bundled up together in clusters.

It seems probable that, by means of a very dry season in the heart of Africa, they are propagated in such numbers, that the vegetables are not sufficient to sustain them; but, being obliged to find out other countries, they traverse sandy deserts, where finding nothing to allure them from their height, they proceed forward, and thus come into Europe, where they alight on the first green pastures.

Locusts are eaten in many kingdoms of the East, and are caught in small nets; they parch them over the fire in an earthen pan; and when their

their wings and legs are fallen off, they turn reddish like boiled shrimps; The natives of Barbary eat them fried with salt; they are said to taste like crayfish.

There is a locust in Tonquin about the bigness of the top of a finger, and as long as the first joint. It breeds in the earth, in low grounds. In January or February they issue from the earth in vast swarms; at first they can hardly fly, so that they often fall into the rivers in great numbers; and the natives, in these months, watch the rivers, to take them up in multitudes in small nets. They either eat them fresh, broiled on the coals, or pickle them for keeping. They are considered as a great delicacy in that part of the world, as well by the rich as the poor. They are regularly brought to market.

The GREAT WEST-INDIAN LOCUST, individually considered, is the most formidable; about the thickness of a goose-quill; the body divided into nine or ten joints, in all six or seven inches long. It has two small eyes, standing out of the head like those of crabs, and two feelers like long hair; the whole body is studded with small excrescences, which are not much bigger than the points of pins; the shape is roundish, and the body diminishes in circumference to the tail, which is forked into two horns; between these there is a sort of a sheath, containing a small dangerous sting. If any person happens to touch this insect, he is sure to be stung, and is immediately taken with a shivering and trembling, which may soon be checked by rubbing the place affected with a little palm-oil.

Though there be a species of CRICKET that lives in the woods and fields, yet we are best acquainted with the House-Cricket, whose voice is so well known behind a country fire in a winter's evening. The cricket very much resembles the grasshopper in shape, manner of ruminating, voice, leaping, and method of propagation. It differs in colour, which is uniformly a rusty brown; its food is various, and its place of residence most usually the warmest chinks of a country hearth; where they once make their abode, they are sure to propagate. They are of a most chilly nature, seldom leaving the fire-side; and, if undisturbed, are seen to hop from their retreats to chirrup at the blaze. The wood-cricket is extremely timorous; but the chimney-cricket, being used to noises, disregards them, and people near it. Whether the voice of this animal is formed by a fine membrane at the base of the wings, is not ascertained; nor do we know the use of this voice, since anatomical inspection has not been able to discover the smallest organs of hearing.

doubtless they can distinguish sounds, though probably not like the more perfect ranks of nature : certainly their call is often regularly answered : none but males are vocal. As the cricket lives chiefly in the dark, its eyes seem formed for obscurity ; to surprise it, requires only to light a candle unexpectedly, by which being dazzled, it cannot find the way back to its retreat. It is very voracious ; eats bread, flour, meat ; is fond of sugar : never drinks. Except in the very coldest weather, never ceases chirping.

Of all the kinds the MOLE-CRICKET is most extraordinary ; is a large insect, two inches and a half in length, and three quarters of an inch in breadth. At the extremity of the tail are two hairy excrescences, resembling in some sense the tail of a mouse. The body has eight scaly joints or separate folds, brown above, deeper tinged below ; wings long, narrow, terminate in a point ; each has a blackish line running down it ; when extended, they seem much broader than could be supposed. The shield of the breast is firm, blackish, and hairy ; the fore-feet, which are this animal's principal instruments of burrowing, are strong, webbed, and hairy ; it generally runs backward ; lives under ground, where it burrows faster than a mole. Is thought to be amphibious. Is detested by gardeners ; for in a single night it will run along a furrow newly sown, and rob it of all its contents. Its legs are so formed that it can penetrate the earth in every direction ; before, behind, and above. At night it ventures from its under-ground habitation, and has its chirping call. The female makes a cell of clammy earth, large enough to hold two hazle nuts, and in this she lays her eggs. The whole nest equals a hen's egg, is closed up, and well defended from the air and enemies. The eggs are generally a hundred and fifty, white, the size of a carraway. The black beetle, being an under-ground inhabitant, would devour or destroy the eggs ; to prevent this, the female mole-cricket is often posted as a sentinel near the nest ; and when the black invader plunges in to seize its prey, the guardian insect seizes him behind, and instantly bites him in two. Wherever the nest is, there seems a fortification, avenues, and entrenchments drawn round it ; numberless winding ways lead to it, and a ditch is drawn about it, which few of its insect enemies are able to pass ; also, at the approach of winter, they carry their nest away, and sink it deeper in the ground, that the frost may have no influence in retarding the young brood. As the weather grows milder, they raise their magazine till near the surface, to receive the genial influence of the sun, without exposing it. Should the frost unexpectedly return, they sink it again.

THE EARWIG, THE FROTH INSECT, AND SOME OTHERS.

OF all this class of insects, the **EARWIG** undergoes the smallest change. This animal is so common it scarce needs a description : its swiftness in the reptile state is not less remarkable than its indefatigable velocity when on the wing. That it is very prolific appears from its numbers ; it is harmless. It is provided with six feet, and two feelers : the tail is forked, and with this it often attempts to defend itself against assailants ; but its attempts no way serve to defend it. The deformity of its slender figure has subjected it to an imputation which has more than once proved its destruction. These reproaches are groundless. It lives among flowers, and destroys them. When fruit has been wounded by flies, the earwig generally comes in for a second feast, and sucks those juices they began to broach.

The earwig is hatched from an egg. There are various kinds of this animal, which chuse different places to breed in ; in general, under the bark of plants, or in the clefts of trees beginning to decay. They proceed from the egg in that reptile state in which they are most commonly seen ; as they grow larger, the wings under the skin begin to burgeon. It is amazing how very little room four large wings take up before they are protruded : their sheath folds and covers them so neatly, that the animal seems without wings ; and, when burst from confinement, they can be closely folded into a very narrow compass. When the earwig has become winged, it flies in pursuit of the female, which is its whole business. It lives, in its winged state, but a few days ; and having provided posterity, dries up and dies.

To this order of insects we may refer the **CUCKOW-SPIT** or **FROTH-WORM**, that is often found hid in a frothy matter on the surface of plants. It has an oblong, obtuse body ; a large head, with small eyes ; four wings, the external dusky brown, marked with two white spots ; the head black. The spume in which it wallows is its own formation, and resembles frothy spittle. It proceeds from the vent and other parts of the animal ; if wiped away, a new quantity will quickly succeed. Within this spume it acquires four tubercles on its back, wherein are the wings ; these bursting, it becomes winged, flies to meet its mate, and prolongs its kind.

The WATER TIPULA has an oblong slender body, four feet fixed on the breast, four feelers near the mouth; four weak wings, apparently not proper for flying, but leaping only. It runs with wonderful lightness on the surface of the water, so as scarcely to put it in motion. It is sometimes seen in rivers, and on their banks, especially under shady trees; and generally in swarms.

The COMMON WATER-FLY also breeds in this same manner. This is by some called the Notonecta, because it does not swim on its belly, but on its back; nor can we help admiring that fitness in this insect for its situation, as it feeds on the under side of plants which grow on the surface of the water; therefore, being formed mouth upwards, it feeds with greater convenience.

The WATER-SCORPION is near an inch in length, and about half an inch in breadth. Its body nearly oval, very flat and thin; its tail long and pointed. The head small; the feelers appear like legs, resembling the claws of a scorpion, but without points. This insect is generally found in ponds, and is very tyrannical and rapacious. It destroys twenty times as many as its hunger requires. I have seen one of these, put into a basin of water, in which were thirty or forty worms of the libellula kind, each as large as itself, destroy them all in few minutes, getting on their backs, and piercing with its trunk through their body. These animals however, though so formidable to others, are nevertheless themselves greatly overrun with a little kind of louse, about the size of a nit, which very probably repays the injury which the water-scorpion inflicts upon others.

Water scorpions live in the water by day; out of which they rise in the dusk of the evening, and flying from place to place, betake themselves, in quest of food, to other waters. The insect, before its wings are grown, remains in the place where it was produced; but, when perfect, sallies forth in search of a companion, to continue its posterity.

THE EPHEMERA.

THAT there should be a tribe of flies whose duration extends but to a day, seems surprising; but the surprise increases, when we are told

told that some of this kind seem limited to an hour. The reptile from which they are bred is not short-lived; but sometimes lives two years, and many times three.

Ephemeras, of which are various kinds, are produced from eggs, in the form of worms; from whence they change to aurelias, a kind of middle state between a worm and a fly; from whence they take their last mutation into a beautiful fly, of longer or shorter duration, according to its kind.

The ephemera fly is a beautiful winged insect, of strong similitude to the butterfly, both in shape, wings, and size; but its wings are not covered with painted feathers, but are very transparent and thin; has four wings; the uppermost much the largest: when at rest, generally lays its wings one over the other, on the back. The body is long; has six rings, larger at the origin than the extremity; from this proceeds a tail longer than all the rest of the fly, consisting sometimes of three threads of equal length, sometimes of two long and one short. To acquire this beautiful form, the insect has undergone several transmutations: but the hour of its perfection is the hour of its death; the reptile of this fly inhabits the water, and resembles fishes in many particulars; having gills by which it breathes at the bottom, and the tapering form of aquatic animals. These insects have six scaly legs, fixed on their corselet. Their head is triangular: the eyes placed forward, distinguished by their largeness and colour. The mouth has teeth; the body consists of six rings; that next the corselet largest, growing less and less to the end; the last ring is the shortest, from which the three threads proceed, which are as long as the whole body. Thus the reptile resembles the fly; and only requires wings to be near perfection.

There are several kinds of this animal, and their aurelias are of different colours; yellow, brown, or cream-coloured. Some bore themselves cells at the bottom of the water, from which they never stir out, but feed on the mud composing the walls of their habitation; others range about in the water, or quit that element to feed on plants by the river side, and then return to it for safety and protection.

The reptile, though it lives long, offers little to excite curiosity; hid at the bottom of the water, it feeds almost wholly within its narrow habitation. Into its fly state it crowds its most various transactions. The sign whereby to know that these reptiles will change into flies shortly, is a protuberance of wings on the back; so that the wings are in some degree visible through their

their external sheath. Along the banks of the Rhine, or the Seine near Paris, about three days in the midst of summer, their numbers and assiduity are astonishing: the whole air seems alive with the new-born race, and the earth is covered with their remains. The aurelias beneath the water wait only for evening to begin their transformation. The most early shake off their old garments about eight o'clock; the later before nine. They are scarce lifted above the water, ere their old sheathing skin bursts; and through it a fly issues, whose wings, the same instant, are unfolded, and lift it into the air. Millions thus rise to the surface; and fill every quarter with their flutterings. But the whole soon fall to the ground, and cover the earth, like a deep snow; every object they touch becomes fatal; and they instantly die, if they hit even against each other.

The males seem only born to die: they follow not the opposite sex; but after fluttering an hour or two, they drop. But the females are scarce risen from the water, and have dried their wings, ere they hasten to drop their eggs back again. If they happen to flutter on land, they deposite their burthen where they drop. We know not how these eggs are fecundated. The females are in such haste to deposite their eggs, that multitudes fall to the ground; but the greatest part are laid in the water. As they flutter on the surface, two clusters are seen issuing from the extremity of their body, each containing about three hundred and fifty eggs.

It would seem there was a necessity for such fertility, as in its reptile state it is the favorite food of every kind of fresh-water fish. In vain these little animals form galleries at the bottom of the river; many kinds of fish break in on their retreats, and thin their numbers. These insects are the most grateful bait for fish. The usual date of these flies is two or three hours; yet some live several days; and one kind, after quitting the water, has to quit another case or skin. These are often seen in fields and woods, but frequently in the vicinity of water. They are often found sticking on walls and trees, with the head downwards, without changing place, or sensible motion; waiting for the moment when they shall be divested of their last garment, which sometimes does not happen for two or three days.

CATERPILLARS.

CATERPILLARS alone, with their butterflies and moths, make a third part of insects. In their butterfly state, they are prodigiously beautiful and splendid. The fly may therefore well excite our curiosity to examine the reptile.

Caterpillars may be distinguished from worms or maggots by their feet; they are the earliest seen in spring on almost every vegetable and tree, eating its leaves. They have feet before and behind, and move forward by arch-like steps made by their fore and hinder parts: they climb vegetables, and stretch themselves out from their boughs and stalks, to reach food at a distance; have from eight feet to sixteen. A butterfly or a moth is distinguished by its wings covered with a painted dust, of various beauty.

Their transmutations are more numerous than those of insects yet mentioned; they are placed in the third order of changes by Swammerdam. When excluded from the egg, they assume the form of a small caterpillar, which feeds and grows larger every day, often changing its skin, but preserving its form. When come to a certain magnitude, it discontinues eating, makes itself a covering or husk, in which it remains wrapped up, seemingly without life or motion; and after some time spent in this state, it bursts confinement, and comes forth a beautiful butterfly.

Experience proves that Caterpillars are hatched from the eggs of butterflies; and the fly is very careful in depositing its eggs where they are likely to be hatched with greatest safety and success. During winter, they are in an egg state; and brave the rigours and humidity of climate: often exposed to its changes, still they preserve the latent principle of life which is to be exerted at the approach of spring.

But all caterpillars rise not from eggs in spring; for many have subsisted in their aurelia state during the rigours of winter; some inclosed in a kind of shell, which they spun for themselves at the end of autumn; some concealed under the bark of trees; others in the chinks of old walls; and many buried under ground. From these issue a variety of butterflies, and adorn the early part of the year with flutterings. Some caterpillars continue in their reptile state through the severe season, in some secure retreat, where they remain motionless and insensible, as if

actually dead. Of this kind are found great numbers together, inclosed in one common web, to protect them from the injuries of the air. Some butterflies live all the winter : these are found lifeless and motionless in the hollows of trees, or the clefts of timber ; but, being approached to a fire, they recover life and activity, and seem to anticipate the desires of spring. Many are hatched from their egg at the foot of a tree, and climb to its leaves for subsistence : the eggs of others have been glued by the parent butterfly to the leaves ; and they are no sooner excluded from the shell, but they find themselves in the midst of plenty.

The caterpillar recent from the egg is small and feeble, and seems to make no great consumption ; but as it increases in magnitude it improves in appetite ; and when adult is ravenous. A single caterpillar will eat double its own weight of leaves in a day.

The body of a caterpillar is composed of rings, pretty near circular or oval ; generally twelve ; membranaceous. The head is connected to the first ring by the neck, which is generally so short it is scarce visible : the head is covered by a shell ; the jaws are placed rather vertically, each armed with a large thick tooth, with which some defend themselves against their enemies. Though the mouth be shut, the teeth are uncovered, and seldom without employment. Many, while young, eat only the succulent part of the leaf, and leave the fibres ; others eat the whole leaf clean away. Some eat all day long, others have their hours of repast, and some chuse the night : to attack a leaf, it places the edge of the leaf between its feet, which keep it steady, while the teeth are cutting it : these act somewhat like a gardener's sheers ; and every morsel is swallowed as soon as cut. Some feed on very narrow leaves, not broader than their mouths ; these it devours from the point.

Of their feet the six foremost have a shining gristly covering ; and are called shelly legs. The hindmost, whatever be their number, are soft and flexible, and are called membranaceous. With regard to their external figure, they are either smooth or hairy : the first kind is soft to the touch, or hard like shagreen ; the latter hairy, and as it were thorny ; and generally, if handled, stings like nettles.

Caterpillars, in general, have six small black spots on the fore ring, a little to the side of the head : three larger than the others, convex and transparent : these Reaumur takes to be eyes.

The stigmata, or holes on its sides, through which it is supposed to breathe, are easily discoverable : nine on a side, rather nearer the belly than the back ; a hole for every ring of the body, except the second, the
third,

third, and the last. These oval openings may be considered as so many mouths, through which the insect breathes into its lungs, which are consequently eighteen. They appear at first view to be hollow cartilaginous tubes, mother-of-pearl colour. They often unite with each other; some open into the intestines, and some go to different parts of the surface of the body. That these convey air, appears from the experiment of Malpighi; who by stopping up the mouths of these stigmata with oil, quickly suffocated the animal. Oil on other parts of the body, leaving the stigmata free, seemed innocent; the insect continued to move and eat as usual: he rubbed on the stigmata of one side, and it underwent a partial convulsion, but recovered soon after. Caterpillars will live in an exhausted receiver several days.

The intestines run straight from the mouth to the anus. They resemble a number of small bags opening into each other; strengthened on both sides by a fleshy cord, by which they are united. Caterpillars often cast the internal coat of their intestines with their food, in their frequent changes. But the intestines take up a small part of the body, compared to the fatty substance in which they are involved. This substance changes its colour when the insect's metamorphosis approaches, and from white usually becomes yellow. All caterpillars spin at one time or other, like the silk-worm.

Many caterpillars change their skins five or six times in a season; and this cast-off covering seems so complete, that it might be mistaken for the real insect. Among hairy caterpillars, the cast skin is covered with hair; the feet, as well gristly as membranous; remaining; even the parts which nothing but a microscope can discover, are visible in it; all the parts of the head; not only the skull, but the teeth. As the time approaches for the caterpillar to cast its skin, its colours become more feeble, and the skin seems to wither and dry like a leaf no longer supplied with moisture. A day or two before the critical hour, the insect ceases to eat, loses its usual activity, and seems immovable: it seeks security; and, no longer timorous, seems regardless of the touch. It often bends itself, elevates its back, stretches itself to its utmost extent: lifts up its head, and lets it fall, waves it three or four times from side to side, and then remains quiet. At length, some of the rings of its body, particularly the first and second, swell considerably, the old skin distends and bursts; till, by repeated swellings and contractions in every ring, the animal disengages itself, and creeps from its inconvenient covering, in the space of a minute; and seems to enjoy new vigour, as well as colouring and beauty. The hairy preserve their hair; for every hair appears to have been drawn.

A new crop of hair grows between the old skin and the new, and probably helps to throw off the external covering.

The caterpillar begins at last to prepare for its change into a chrysalis. It is probable all parts of the butterfly lay hid in the insect, in its reptile state; and, when perfected, its first great and principal change is into an aurelia, or chrysalis. Preparatory to this, it attaches itself to the stalk or stem of the plant, often voids even the internal membrane which lined its intestines. Those which spin a web, set about that operation; those which have already spun, await the change in patience. When it has done spinning, it strikes in the claws of the two feet under the tail, and afterwards forces in the tail itself. If taken from the web they appear in great languor; and, incapable of walking, thus they remain one or two days, preparing to change; their bodies bent into a bow, which they occasionally straighten. As their change approaches, their body becomes more and more bent; their extensions and convulsive contractions more frequent. The animal quits the hinder part of its skin to drive itself up into the fore part, still continuing to heave and work as before; the skull bursts into three pieces; and an opening is made in the three first rings, through which the insect thrusts forth its naked body, with strong efforts, and gets free from its caterpillar skin. Now the parts of the future butterfly are visible; but so soft, that the smallest touch discomposes them. The animal is now become helpless and motionless; waiting for the air to dry up its superficial moisture, and supply it with a crust for resisting injuries: it is now green. In ten or twelve hours its parts harden, its external covering becomes firm; and in about four-and-twenty hours the chrysalis may be handled without danger. Such is the little pod or cone so common by every pathway, sticking to nettles, and sometimes shining like polished gold; whence its name, Chrysalis.

Some mix sand with their gummy and moist webs, to strengthen the incrustation; others bury themselves in the ground. Those that are to remain in this state but a few days, choose some tender leaf, which they render more pliant by diffusing a kind of glue on it: the leaf gradually curls up, and withering as it enfolds, the insect wraps itself within it. Others fasten their tails to a tree, or to the first worm-hole they meet in a beam, and there wait. Such as are to lie several months in this state, act with greater circumspection: either mix their web with sand, or build deeper in wood. Such as prefer the leaves of willows, break their tender twigs into small pieces, then pound them to powder; and, by
their

their glutinous silk make a kind of paste, in which they enwrap themselves. Many are the forms they assume in this helpless state; and often the most deformed butterflies issue from the most beautiful aurelias. Some continue in this state ten days, some a month, some a year. The same species of insect does not at all times assume the same hue as an aurelia. In some the beautiful gold colour is found; in others it is wanting. It is formed by a beautiful transparent brown varnish, laid on a white ground; the white gleaming through. In this state, the life of the insect may be retarded or quickened, without injury: the first, by preventing the evaporation of its humidity; but, by evaporating its moisture, in a warm situation, the animal assumes its winged state before its usual time.

If shut up within a cone, the butterfly always gets rid of the natural internal skin of the chrysalis before it eats its way through the cone. To attain this, there seems a violent agitation in the humours of the body. Its fluids seem driven rapidly through the vessels; it labours violently with its legs, and struggles to get free. These motions concurring with the growth of the wings and body, the brittle skin which covers it at length gives way, by bursting in four distinct and regular pieces. The skin of the head and legs first; then the skin at the back disengages the back and wings. The butterfly, as if fatigued, remains quiet for some time, its wings pointed downward, its legs fixed in the skin it had just thrown off. Its wings take up such little room, one would wonder where they were hidden: but soon after they expand so rapidly, the eye can scarce attend their unfolding; they become five times larger than before, growing thinner as they become broader; all the spots and paintings, before scarce discernible, are proportionably extended; so that what seemed only confused, unmeaning points, now become distinct and beautiful ornaments. The wings, so suddenly extended, appear like wet paper, soft, and wrinkled. In half an hour they dry, and their wrinkles disappear. The butterfly discharges three or four drops of a blood-coloured liquid, as the last remains of its superfluous moisture. The exit of aurelias inclosed within a cone, is more difficult, as they have the cone to break through: but this they quickly perform by butts with the head violently against it, and probably with their eyes, that are rough and like a file, rubbing the internal surface away.

The butterfly needs no other food than the dews of Heaven, and the

the honeyed juices distilled from every flower. Those of the warm climates are the largest and most beautiful.

Butterflies have four wings; and, though two of them be cut off, can fly with the two remaining. They are transparent, but rendered opaque by the feathery dust with which they are covered; of different dimensions and forms, generally supported on a footstalk, regularly laid on the whole surface, and of a perfectly beautiful arrangement, like the tiles of an house; those of one rank a little covered by those that follow: on one part may be seen oval studs; on another, clusters of studs heart-formed, or long, or triangular; interspersed with taller studs. The wing is composed of several thick nerves, very strong, though light. The animal supports itself long in air, although its flight be not graceful. When the butterfly designs to visit a considerable distance, it ascends and descends; going sometimes to the right, sometimes to the left; it flies thus irregularly in pursuit of its mate, which it can discover at a mile's distance.

The animal may be divided into three parts; the head, the corselet, and the body. The body is the hinder part composed of rings, generally concealed under long hair, with which that part is clothed. The corselet is more solid than the rest of the body, because the fore wings, and the legs, are fixed therein. The legs are six; four only are used by the animal; the two fore legs being often concealed in the long hair of the body. These parts internally have the same set of vessels in the butterfly as in the caterpillar; but the blood or humours which in the caterpillar circulated from the tail to the head, in the butterfly circulate from the head to the tail.

The eyes of butterflies have not all the same form; some are large, others small; some are the larger portion of a sphere, others but just appearing from the head. In the outward coat of all is a lustre, offering the colours of the rainbow; it resembles a multiplying glass; having a great number of sides, or facets, like most other insects.

Leuwenhoek asserts there are above six thousand facets on the cornea of a flea. Puget adapted the cornea of a fly to see objects through it by means of a microscope; and nothing could exceed the strangeness of its representations: a soldier, seen through it, appeared an army of pigmies; for it multiplied and diminished objects: the arch of a bridge exhibited a most magnificent spectacle; and the flame of a candle seemed a beautiful illumination.

Butterflies, like most flying insects, have on their heads two feelers,

moveable at their base ; and having a great number of joints, to turn them in every direction. Those of butterflies are placed at the top of the head, pretty near the external edge of each eye.

The trunk, few insects of the butterfly kind are without. This is placed exactly between the eyes ; and, when not employed in seeking nourishment, is rolled up, like a curl. A butterfly, when feeding, settles on some flower ; the trunk is then uncurled, thrust out, and is employed in searching the flower to its very bottom, be it ever so deep. This trunk consists of two equal hollow tubes, nicely joined to each other, like the pipes of an organ.

But the greatest number fly by night ; these are *MOTHS*. Butterflies fly by day, moths by night. They are distinguished by their *antennæ* or feelers : those of the butterfly being clubbed, or knobbed at the end ; those of the moth pointed.

The general rule among insects is, that the female is larger than the male : the male smaller and slenderer ; the female more thick and oval. If they be disturbed while united, the female flies off with the male on her back, who seems entirely passive. The females of many moths and butterflies seem to have assumed their form merely to fecundate their eggs, and lay them. After a junction with the male of about half an hour, they deposite their eggs, and die : they are impregnated by the male at one aperture, and lay their eggs by another. Their eggs are disposed in the body like a bed of chaplets ; when excluded, are whitish : some oval, some round, some flatted. The shell of the egg, though solid, is thin and transparent ; each egg contains but one caterpillar. The butterfly is careful to place her brood only on plants that afford good nourishment to its posterity ; not the plant most grateful to itself in its winged state, but such as it has fed on, in its reptile form. These eggs are attached to the leaves of the favourite plant, by a sort of glue ; sometimes round the tender shoots of plants, in the form of a bracelet, or a ring, two hundred in each. Some secure their eggs, by covering them with hair, plucked from their own bodies, for warmth, and concealment.

All female moths lay their eggs shortly after they leave the chrysalis ; but many butterflies flutter the whole summer without laying, till towards winter : some continue the winter in hollows of trees, nor provide for posterity till the beginning of April, when they leave their retreats, deposite their eggs and die.

The caterpillar has of all animals the greatest number of enemies ; and exists by its surprising fecundity. Some animals devour them by

hundreds ; others, more minute, destroy them in various ways ; a sparrow and its mate, that have young, destroy three thousand caterpillars in a week. Some of the caterpillar kind, that seem fitted only to eat leaves, will however eat each other ; the strongest devouring the weak, in preference to their vegetable food. That which lives on the oak, seizes its companions, when it can, by the first rings, and inflicts a deadly wound ; then feasts in tranquillity on its prey.

Many flies lay their eggs either on or within their bodies ; and as these turn into worms, the caterpillar nourishes a brood of intestine enemies, that must shortly be its destruction. " Towards the end of August," says Reaumur, " I perceived a little fly, of a beautiful gold colour, busily employed on the body of a large caterpillar, of that kind which feeds upon cabbage. I gently separated that part of the leaf on which these insects were placed, from the rest of the plant, and placed it where I might observe them more at my ease. The fly, wholly taken up by the business in which it was employed, walked along the caterpillar's body, now and then remaining fixed to a particular spot. Upon this occasion, I perceived it every now and then dart a sting, which it carried at the end of its tail, into the caterpillar's body, and then drew it out again, to repeat the same operation in another place. It was not difficult for me to conjecture the business which engaged this animal so earnestly ; its whole aim was to deposite its eggs in the caterpillar's body ; which was to serve as a proper retreat for bringing them to perfection. The reptile, thus rudely treated, seemed to bear all very patiently, only moving a little when stung too deeply ; which, however, the fly seemed entirely to disregard. I took particular care to feed this caterpillar ; which seemed to me to continue as voracious and vigorous as any of the rest of its kind. In about ten or twelve days, it changed into an aurelia, which seemed gradually to decline, and died. Upon examining its internal parts, the animal was entirely devoured by worms ; which, however, did not come to perfection, as it is probable they had not enough to sustain them within."

The large cabbage caterpillar is so subject to this injury, that, at certain seasons, it is much easier to find them with than without them. The *ichneumon-fly* particularly infests these reptiles, and is of all others most formidable to infests of various kinds. The spider himself often falls a prey to the *ichneumon*, who pursues him to his retreat, despises his nets, and tears him in pieces, in his own labyrinth. This insect, redoubtable as the little quadruped that destroys the crocodile, has received the same name ; it deposite its eggs in the caterpillar's body ; ten, fifteen, or twenty.

As

As they are laid in parts not mortal, the reptile still lives and feeds, changes its skin; and sometimes into an aurelia: still the fatal intruders within secretly devour its substance: soon after they burst through its skin, and quit it to spin themselves a covering, previous to their own transformation. It is astonishing sometimes to see the number of worms, the thus issue from the body of a single caterpillar, but more that they should devour its entrails, without destroying its life: but they feed only on the fatty substance within the caterpillar's body; and not on its vitals.

THE SILK WORM.

IT is supposed that silkworms were not brought into Europe till the beginning of the twelfth century; when Roger of Sicily brought some from Asia Minor, after his return from the Holy Land, and settled them in Sicily and Calabria.

The silkworm is a large caterpillar, whitish, with twelve feet, and producing a moth. Its cone is formed for its covering while in the aurelia state; the threads of several of these, wound off, and united, form strong and beautiful silken threads. Feeding these worms, gathering, winding, twisting, and weaving the silk, is a principal manufacture of Europe.

There are two methods of breeding silkworms: they may be left at liberty on the trees where they are hatched; or they may be kept in a place built for that purpose, and fed every day with fresh leaves. The first method is used in China, Tonquin, and other hot countries; the other in places where the animal has been artificially propagated, and continues a stranger. In the warm climates, the silkworm proceeds from an egg, which has been glued by the parent moth on the mulberry-tree, and which remains there during winter. Unaffected by the weather, frosts that kill the tree, injure not the silkworm. The insects never quit the egg till nature has provided a supply in the budding leaves for their support; then bursting from their eggs, they crawl on the leaves, and feed voraciously. After some months feeding, they deposit on every leaf small cones of silk.

But in European climates, the frequent changes of weather, and the hea-

vy dews forbid this method. A room is preferred with a south aspect; the windows well glazed, the walls well built, the floor exceeding close, so as to admit neither air nor insects. In the middle are four pillars forming a pretty large square. Between these are different stories made with ozier hurdles; and under each hurdle a floor, with an upright border round, hung on pulleys, placed or taken down at pleasure. When the worms are hatched, some tender mulberry leaves are placed in the paper box in which the eggs were, and which is large enough to hold a number. When they have acquired strength, they must be distributed on beds of mulberry leaves in the different stories. They have a thread by which they can suspend themselves, to prevent any shock by a fall. Fresh leaves must be brought every morning, and strewed very gently and equally over them; the silkworms will forsake the old leaves. The leaves must be gathered when the weather is dry, and kept dry, if a store be necessary. To give them air, open their chamber windows, when the sun shines warmest.

The worm, when it bursts the shell, is extremely small, and black; but the head more shining black than the body: some days after, they begin to turn whitish, or grey. The insect throws off its skin, and appears clothed anew several times. When ready to assume the aurelia form, the animal forsakes, for the last time, all food and society, and prepares its cone, or ball of silk, which is spun from two little longish kinds of bags that lie above the intestines, and are filled with a gummy fluid, of a marigold colour. The little animal is furnished with a surprising apparatus for spinning it to every degree of fineness, somewhat like a wire-drawer's machine. The threads proceed from two gum bags, each supplying its own. The thread is flattened on one side, and grooved along its length; seeming as if doubled just on leaving the body, and that the two threads stick to each other by their gummy quality. Previous to spinning, the silkworm seeks a convenient place to erect its cell. When it has found a leaf or chink to its purpose, it wreathes its head in every direction, and fastens its thread on every side. Though its first essays seem confused, yet they are not without design: the first threads being thrown at random, to serve as a shelter against rain; for nature having appointed the animal to work on trees in the open air, its habits remain, though it is brought up in a warm apartment. It is composed externally of a kind of rough cotton-like substance, called floss; within the thread is more distinct and even; and next the aurelia, the apartment seems lined with a paper-like substance, but of stronger consistence. The thread lies very irregularly, and winds off now from one side

of the cone, then from the other. This whole thread, if measured, is about three hundred yards long; and so very fine, that eight or ten are generally rolled into one by manufacturers. The cone is in form like a pigeon's egg, most pointed at one end, where the head of the aurelia generally is; and here the insect, when a moth, bursts through. After a fortnight or three weeks the aurelia becomes a moth; when free from its confinement, it appears exhausted with fatigue, and seems produced only to transmit a future brood. It neither flies nor eats; the male only seeking the female: their union continues for four days; the male dies immediately after separation; and she survives him only till she has laid her eggs, which are not hatched into worms till the ensuing spring.

As their bursting through the cone destroys the silk, the manufacturers kill the aurelia, by exposing it to the sun, before the moth comes to perfection, and throw the cones into warm water, till the first thread offers them a clue for winding all off. They generally take eight of the silken threads together; the cones still kept under water, till a proper quantity of the silk is wound off: they do not take all; for the latter parts grow weak and bad. The paper-like substance which remains, some stain with a variety of colours, to make artificial flowers; others let it lie in the water, till the glutinous matter which cements it is dissolved: then carded like wool, and spun with a wheel, it is converted into silk stuffs of an inferior kind.

T H E

FOURTH ORDER OF INSECTS.

IN this class of insects we place a various tribe, first laid as eggs, then excluded as maggots or grubs, then changed into aurelias, with their legs and wings not wrapped up, but appearing; and, lastly, assuming wings, in which state they propagate. Some of these have four transparent wings, as bees; some two membranous cases to their wings, as beetles; some but two wings, which are transparent, as ants. We include the bee, the wasp, the humble bee, the ichneumon-fly, the gnat, the tipula or longlegs, the beetle, the may-bug, the glow-worm, and the ant.

T H E B E E.

TO give a complete history of this insect, whose nature and properties still continue in dispute, is impossible. The account given by Reaumur is sufficiently minute, and wonderful; but many of the facts he relates, are doubted, some denied, though it is not easy to disprove them, nor effectively to contradict the assertions of a man whose life was spent in this study. That he might err is possible, that he erred wilfully none assert; and since his time, none have offered as guides, in whom we may place greater confidence.

There are, says Reaumur, three different kinds of bees: first, the labouring bees, which are the greatest number, and neither male or female: secondly, drones: of a darker colour, longer, and thicker by one third than the former: they are the males; and there is not above a hundred of them, in a hive of seven or eight thousand bees: thirdly, a larger still, and in number fewer; being but one in every swarm: but later observers mention there being sometimes five or six in the same hive. These are called queen-bees, and are said to lay all the eggs from which the swarm is hatched.

In the common working bee, the first remarkable part is the trunk, which

which extracts the honey from flowers. It is formed like a besom, to sweep, or a tongue, to lick it away. The teeth serve in making wax. This is gathered from flowers, like honey; and is that dust or *farina* which fecundates plants: it is molded into wax by the little animal at leisure. A bee enters the cup of a flower, particularly if charged with this yellow farina. Being covered with hair, it rolls itself in the flower, till quite covered with dust, which it brushes off with its two hind legs, and kneads into two little balls. In the thighs of the hind legs are two cavities, edged with hair; into these the animal sticks its pellets. Thus employed, the bee flies from flower to flower, increasing its store, and adding to its stock of wax; until the ball upon each thigh becomes as big as a grain of pepper; when having got a sufficient load, it returns to the hive.

The belly of the bee is divided into six rings, which sometimes shorten the body, by slipping one over the other. It contains, beside the intestines, the honey-bag, the venom-bag, and the sting. The honey-bag is transparent, receives the honey the bee has collected, of which the greater part is carried to the honey-comb; the remainder serves for nourishment: for, during summer, it never touches what has been laid up for winter. The sting is composed of three parts; the sheath, and two darts, extremely small and penetrating, having several sharp points or barbs, which render the sting more painful. The sheath, which has a sharp point, makes the first wound; this is followed by the darts, and then the venom is poured in. The sheath sometimes sticks so fast in the wound, that it is left behind; by which the bee soon after dies, and the wound is considerably enflamed. Without a sting this little animal would have too many plunderers, and lazy animals, fond of honey, would intrude on the sweets of the hive.

All its provisions are laid up for the community; all its arts in building are for posterity. Bees build their cells with wax, fashioned into convenient apartments. When they begin to work, they divide themselves into four companies: one roves the fields in search of materials; another lays out the bottom and partitions of their cells; a third smoothes the insides from corners and angles; the fourth bring food, or relieve those who return with their burthens. They often change tasks; those at work, go abroad; and those from the fields take their places. When any one wants food, it bends down its trunk to the bee from whom it is expected, which then opens its honey-bag, and lets some drops fall

into the other's mouth, which is opened to receive it. In a day's time, they make cells, upon each other, to contain three thousand bees.

The cells are perfect hexagons: double, opening on either side, and closed at the bottom. These lodgings have spaces, like streets, between them, large enough to give the bees free passage; yet narrow enough to preserve the necessary heat. The mouth of every cell is strengthened by a border, which makes the door a little less than the inside of the cell. These cells contain their young, their wax, or their honey. It is their principal care, when first hived, to stop up all the cran- nies, by a resinous gum, more tenacious than wax, called *Propolis*. When the bees begin to work with it it is soft, but acquires a firmer consist- ence every day; till at length it assumes a brown colour, and becomes much harder than wax. The bees carry it on their hinder legs; and some think it is met with on the birch, the willow, and poplar.

By their teeth they model their various buildings; they begin at the top of the hive, and several at a time. Their combs cost them great labour, and are made by insensible additions. Every worm, before it is an aurelia, hangs its old skin around its cell: the same cell is often tenanted by three or four worms in a summer; and the next season, by three or four more: thus being lined, six or eight deep, it becomes at last too nar- row for a new brood, and is converted into a store-house for honey.

The meal of flowers, of which their wax is formed, is one of their most favourite repasts. On this they live during summer; and lay up a large winter provision of it: this is the bee-bread; without which they starve. Their wax is this meal digested, and wrought into a paste. In April and May, the bees are busy, from morning to evening, in gathering this meal; but when the weather becomes too hot in the midst of summer, they work only in the morning.

The bee has a stomach for wax, as well as honey; in which the powder is altered, digested, and concocted into wax, then it is ejected. A comb, newly made, is white: it becomes yellow as it grows old, and almost black when kept long. Honey is extracted from that part of the flower called the nectarium. It passes into the first stomach, or honey-bag, which appears like an oblong bladder.

How numerous soever is a swarm, all owe their original to the queen- bee; that in one summer gives birth to twenty thousand young: the number of her eggs appearing at one time amounts to five thousand. She may easily be distinguished by her size, and the shape of her body. She will be seen at times attended with a numerous retinue, marching from

from cell to cell, plunging the extremity of her body into many of them; and leaving one small egg in each; if she leave two, the latter is removed. The bees which compose her train are thought to be males. These are larger and blacker than common bees; without stings, and without industry. They seem formed only to transmit a posterity. If their queen die, the bees leave off working, and take no farther care. If another queen is presented them, they acknowledge her for sovereign, and apply to their labour.

This fertility of the queen-bee, and the great attentions paid to her, are controverted by more recent observers. They assert, that the common bees are parents themselves; that they deposite their eggs in the cells which they have prepared, and bring forth a progeny wholly their own.

The egg is fixed to the bottom of the cell, in a single point. A day or two after it is deposited, the worm is excluded like a maggot rolled up, and lying softly on a bed of a whitish coloured jelly, on which it begins to feed. The working bees attend it with the most anxious tenderness; and furnish it every hour with a supply of this whitish substance, which is a composition of honey and wax in their own bowels. The worm in less than six days comes to full growth, and lining the walls of its apartment with a silken tapestry, which it spins in the manner of caterpillars, soon becomes an aurelia, exhibiting legs and wings of the future bee. In about twenty or one and twenty days the bee is completely formed, and opens its prison, by piercing with its teeth the waxen door that confines it; but is yet moist, and incommoded: the bees flock round it, and lick it clean with their trunks; while others feed it with honey: others cleanse the cell that has been just left, for a new inhabitant. The young bee quickly repays their care by its industry; for as soon as its external parts are dry, it begins the task, which it pursues unremittingly. Instructed only by nature, it goes in quest of flowers, chooses only those that yield it a supply, rejects such as are barren of honey, and, when loaded, returns to the common habitation; then it gathers the mealy powder of the flower, which is converted into wax; and the very first day returns with large balls in its thighs.

Above a hundred are excluded in one day; and often they are scarcely excluded, when they are obliged, by the old bees, to seek new habitations; even notwithstanding their resistance, should they attempt it. In different countries, these swarms or colonies appear at different times of the year. The night before, an unusual buzzing is heard in the hive; all labour is discontinued; every bee is either employed in forcing, or re-

luctantly yielding a submission : at length, after some tumult, a queen bee is chosen, to attend the young colony, which crowding round their protectress, sets off. The usual time of swarming is from ten in the morning to three in the afternoon, when the sun shines bright. They flutter a while, and sometimes undertake a distant journey, but more frequently seek some neighbouring asylum. In countries, where the bees are wild, and unprotected by man, they build their waxen cells in the hollow of a tree ; but with us they seem improvident in their choice, and the first green **branch** that stops their flight, seems to be thought sufficient for their abode. When the queen is settled, the rest of the swarm soon follow. Sometimes there are two or three queens to a swarm, and the colony is divided into parties ; the bees, by degrees, desert the weakest for the most powerful protector. The deserted queen takes refuge under the new monarch, and is soon destroyed. If there should be a queen bee, belonging to the new colony, left in the old hive, she always suffers the fate of the former, unless the hive be full of wax and honey.

At the latter end of the summer, when the colony is sufficiently stored with inhabitants, a most cruel policy ensues. The drone bees, who had hitherto led a life of indolence and pleasure, impregnating the queen, and rioting on the labours of the hive, now fall a sacrifice to the general resentment of the working bees, which declare war against them ; and in two or three days the ground round the hive is covered with their bodies. They even kill such drones as are yet in the worm state in the cell, and eject their bodies.

Sometimes upwards of forty thousand bees are found in a single hive. In less than twenty-four hours they make combs twenty inches long, and seven or eight broad. Sometimes they will half fill their hives with wax in less than five days. In the first fifteen days they always make more wax than they do during the rest of the year.

In some parts of France and Piedmont, and Egypt, they have a kind of floating bee-house, well defended from accidental storms, and floating gently along the river. As the bees are continually choosing fresh flowery pasture along the banks, they are furnished with sweets before unrished.

There are two kinds of honey, the white and the yellow. The white is taken without fire from the honey-combs. The yellow is extracted by heat, and squeezed through bags in a press. The best honey is new, thick, and granulated, of a clear transparent white colour, of a soft and aromatic smell, and of a sweet lively taste. Honey made in mountainous countries, is preferable to that of the valley : honey made in

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the spring, to that gathered in summer; which yet is more valuable than that of autumn.

In Guadaloupe, the bee is less by half than the European, and blacker and rounder; has no sting, and makes cells in hollow trees: if the hole is too large, the bees form a sort of waxen house, pear-shaped; in this they lodge, store their honey, and lay their eggs. They lay up their honey in waxen vessels, the size of a pigeon's egg, black or deep violet colour; and so jointed together, that there is no space between them. The honey never congeals, but is fluid, of the consistence of oil, and amber coloured. There are found little black bees, without a sting, resembling these, in all tropical climates; and though these countries have bees, like our own, yet those form the most useful tribe in those parts. Their honey is more palatable, and less surfeiting than ours; the wax is so soft, that it is only used for medical purposes, not being hard enough to form candles.

Of insects that receive the name of bees there are several. The HUMBLE-BEE is the largest, equalling the first joint of the middle finger. These are seen in every field and flower. They build in holes in the ground, of dry leaves, mixed with wax and wool, defended with moss. Each makes a separate cell, about the size of a small nutmeg, round and hollow, containing the honey in a bag. Several of these cells are joined, so that the whole appears like a cluster of grapes. The females, which have the appearance of wasps, are few; their eggs are laid in cells, which the rest soon cover with wax. Uncertain whether they have a queen; but one is much the largest, without wings or hair, all black like polished ebony. This views the works, from time to time, and enters the cell, as if to see whether every thing is right. In the morning, the young humble-bees are idle, and not inclined to labour, till one of the largest thrusts half its body from a hole on the top of the nest, beats its wings, buzzing till the colony is in motion. The humble-bees gather honey, but not so fine, or good, as the common bees, nor the wax so clean, or capable of fusion.

The WOOD BEE is larger than the common queen-bee; blueish black, smooth and shining; appears at the approach of spring, flying near walls of a warm aspect. This bee makes its nest in some half-rotten piece of wood, which it scoops for its purpose; never in standing trees. The holes turn to one side; their opening is sufficient to admit a finger, from whence runs the inner apartment, generally twelve or fifteen inches long. Their teeth bore these cavities; they usually branch into three

or four apartments: in each they lay eggs, to the number of ten or twelve, each separate and distinct; the egg is involved in a sort of paste, at once the young animal's protection and nourishment. The grown bees feed on small insects, particularly a very small louse, of a reddish brown colour.

MASON-BEES make their cells with a sort of mortar, made of earth; they build against a wall exposed to the sun. The mortar, which at first is soft, soon becomes as hard as stone, and in this their eggs are laid. Each nest contains seven or eight cells, an egg in every cell, placed regularly one over the other. If the nest remains unhurt, or wants but little repairs, they use it the year ensuing; and often three or four years. A worm with very strong teeth is often found to bore into their little fortifications, and devour their young.

The GROUND-BEE builds in the earth, in round holes, five or six inches deep; the mouth narrow, just sufficient to admit the little inhabitant. They carry out all the earth, grain by grain, to the mouth of the hole, where it forms a little hillock. Sometimes the walks of a garden are undermined by their labours; some of the holes running directly downward, others horizontally beneath the surface. They lay up in these cavities provisions for their young, which consist of a paste that has the appearance of corn, and is sweetish.

LEAF CUTTING-BEES make their nest and lay their eggs among bits of leaves very artificially placed in holes in the earth, of about the length of a tooth-pick case. They make the bits of leaves roundish, and with them line the inside of their habitations. This is further lined by a reddish kind of paste, somewhat sweet or acid. These bees are of various kinds; those that build their nests with chestnut-leaves are as big as drones, but those of the rose-tree are smaller than the common bee.

WALL-BEES make their nests in walls, of a kind of silky membrane, with which they fill up the vacuities between the small stones which form the sides of their habitation. Their apartment consists of several cells, placed end to end, each in the shape of a thimble. The web which lines this habitation is thick, warm, transparent, and whitish, supposed to be spun from the animal's body; the males and females are of a size, but the former are without a sting.

To these varieties of the bee kind might be added several others, which, though different, are not sufficiently distinguished for particular notice.

T H E W A S P.

THE wasp is winged; a sting in its tail; is longer in proportion than the bee; marked with bright yellow circles round its body; swift and active. On each side the mouth this animal has a long tooth, notched like a saw; with these it cuts. Wasps live in community, sometimes ten or twelve thousand together; fierce, voracious, and dangerous, when enraged. Wherever flesh is cutting up, they gorge themselves with the spoil, and fly to their nests with their reeking prey. They make war on every other fly, and the spider himself dreads their approaches.

Wasps have similar occupations to bees for propagation, for nursing and supporting the rising progeny. Among bees is one queen, or two in a hive; among wasps two or three hundred. Wasps are very numerous in summer, employed in gathering provisions for their nest, if made, or in making one. The nest is contrived very artificially. Their principal care is to seek a hole, begun by some animal, a field mouse, a rat, or a mole. They sometimes build on the plain, where dry, but commonly on the side of a bank to avoid water. Their first labour is to enlarge the hole, carrying off the earth. They are furnished with a trunk above their mouths, two saws on each side, which play to the right and left against each other, and six strong muscular legs. They cut the earth with their saws, and carry it out with their legs. The outline of their habitation makes a cavity of about a foot and a half every way. While some are working, others are roving the fields to seek materials. To prevent the earth from falling down, they make a sort of roof with their glewy substance, to which they fix the rudiments of their building, working from the top downwards, as if hanging a bell, which they close at bottom. They build their nests of wood and glew. These they saw, and divide the wood into small fibres, of which they take up little bundles in their claws, letting fall on them a few drops of glewy matter with which their bodies are provided, by which they knead the whole into a paste. This they tread close with their feet, and trowel with their trunks, going backwards as they work. Having repeated this operation three or four times, the composition is flatted out into a small grey leaf, much finer than paper, and pretty firm; with this, placing layer upon layer, they strengthen every partition. They make another entrance to their habitation, either for letting in the warmth of the sun, or for escape. By one of these they

always enter, by the other they fall forth; each being small, but one can pass at a time.

The honey-comb of the wasp is flat, the mouth of every cell downwards. Thus is their habitation contrived, story above story, supported by several rows of pillars which give firmness to the building, while the upper story is flat-roofed and smooth. The pillars are very hard and compact, largest at each end. The cells are for the reception of young, being replete with neither wax nor honey. Each cell is hexagonal; but they are of two sorts, the one larger for the production of the male and female wasps, the other less for the reception of the working part of the community. The females lay their eggs, one in each cell, and stick it in with a kind of gummy matter. This egg produces the insect in its worm-state, which the old females feed till it becomes large. The young worms at a certain size spin a very fine silk. After this they divest themselves of their skins by the usual mode of transformation, the aurelia by degrees is emancipated from its shell, thrusts out its legs and wings, and acquires the colour and shape of its parent.

Though it gathers no honey, no animal is more fond of sweets. It will pursue the bee and the humble-bee, destroy them with its sting, and plunder them of their honey-bag, with which it flies triumphantly loaded to its nest: but fierce battles sometimes ensue, in which the bees make up by conduct and numbers what they want in prowess. When there is no honey to be had, they seek the best and sweetest fruits. From the garden they fly to the city, to the grocers shops, and butchers shambles. They will sometimes carry off bits of flesh half as big as themselves, with which they fly to their nest. Whenever they are found, other flies desert the place immediately.

Every day in summer adds to their numbers; and from their strength, agility, and indiscriminate appetite, were they as long lived as the bee, they would soon swarm on the face of nature the most noxious of plagues: but they live only a single season. While summer heats continue, they are bold, voracious, and enterprising: as the sun withdraws, they lose their courage and activity; as the cold increases, they become more domestic; seldom leave the nest, make but short adventures, flutter about at noon only, and return chilled and feeble. No longer able to provide their growing progeny a supply, they sacrifice them all to the necessity of the times; then forsaking their nests, they seek warmth in the corners of houses, and artificial heat; but before the new year they wither and die; the working wasps first, the males following, and many of the females. One or two females survive the winter, and having been im-

pregnated during the preceding season, in spring each lays eggs in a little hole of her own contrivance. This bundle of eggs, which is clustered like grapes, produces two worms; these, when hatched, give assistance to the female, who is employed in hatching two more; these gathering strength, extricate themselves from their web, and become assistants: fifteen days after, two more appear; thus the community daily increases. The female lays in every cell a male and female: these soon breed in turn, till, from a single female, ten thousand wasps are produced before June. Afterwards they assemble in the middle of summer, and provide for themselves the large and commodious habitation we have described.

In the principal species of the SOLITARY WASP, the insect is smaller than the working wasp. The filament, by which the corselet is joined to the body, is longer and more distinct, and the insect blacker than in the ordinary kinds. From May to July, this wasp is most diligently employed, in contriving and fitting up a commodious apartment for its young, which is not to succeed it till the year ensuing, with unwearied assiduity boring a hole into the finest earth some inches deep, but not wider than its own body. This gallery leads to a wider apartment for lodging its young. It always chooses a gravelly soil, where the earth is almost as hard as stone, digging and hollowing this apartment by no small labour. This insect has two teeth, strong and firm, but not extremely hard: to soften that earth it is unable to pierce, it has a gummy liquor, which, emitted on the place, renders it more easily separable, and the whole becomes a kind of soft paste. If the animal's liquor is exhausted, water from some neighbouring flower or stream supplies the deficiency. After much toil, a hole some inches deep is formed, at the bottom of which is a large cavity: to this what other insect would venture, considering the length and narrowness of the defile? Here the solitary wasp lays its egg; and the nascent animal continues above nine months, unattended and immured. The mother-wasp's next care is to furnish provisions to the young insect when it leaves the egg. She procures little green worms, generally from eight to twelve: this supply laid in, she closes the mouth of the passage, and dies, satisfied with having provided for her future progeny. The diminutive young glutton, just hatched, feasts on the living spoil without any control, till its stock of worms is exhausted, and the time of its transformation approaches; then spinning a filken web, it continues fixed in its cell till the sun calls it from its dark abode the ensuing summer.

West Indian wasps are thicker, and twice as long as the common bee, grey striped with yellow, and have a very dangerous sting. Their cells resemble a honey-comb, in which the young ones are bred. They hang their nests by threads, composed of the same substance with the cells, to the branches of trees, and the eaves of houses, in great abundance, descending like pears, of which shape they are, and as large as one's head. The inside is divided into three round stories, full of hexagonal cells. In some islands these insects are so numerous, that their nests are scarce two feet asunder, and sometimes no precautions can prevent their attacks: the pain of their sting is almost insupportable; the whole visage swells, and the features are so disfigured, that a person is scarcely known by his most intimate acquaintance.

THE ICHNEUMON FLY.

THE ichneumon fly (of which there are many varieties) fears not the wasp itself, but enters its retreats, plunders its habitations, and takes possession of its cell for its own young. The most formidable, and best known, is the common ichneumon, with four wings like the bee, a long slender black body, a three-forked tail, consisting of bristles; the two outermost black, the middlemost red. This instrument is a weapon of great force and efficacy; scarce any substance it will not pierce. This is employed in destroying its prey, and by this the animal deposits her eggs. The male has no such sting; the female uses it with great force and dexterity, brandishing it from side to side, and often wounding those who thought they held her securely.

All this tribe owe their birth to the destruction of some other insect, within whose body they have been deposited, and upon whose vitals they have preyed. The caterpillar, the gnat, and even the spider, so formidable to others, is often their unwilling fosterer. About the middle of summer, when insects are abundant, the ichneumon is seen flying busily about, and seeking proper objects of various kinds, upon whom to deposit its progeny. Some place their eggs in the aurelia of some nascent insect, others in the nest of the wasp; and as both are produced at the same time, the young ichneumon not only devours the young wasp, but

The Ant
Magnified.

but its whole supply of worms. But the greater number of the ichneumon tribe are produced from the back of the caterpillar; and if it survives the worm state, they change into a chrysalis, enclosed in its body. Such is this fly, very terrible to the insect tribe, but of infinite service to mankind. The millions it kills in a summer are inconceivable. Without such a destroyer, the fruits of the earth would only furnish a banquet for the insect race.

T H E A N T.

IT is somewhat surprising, that almost every writer of antiquity should describe this insect as labouring in the summer, and feasting upon the produce during winter. It should seem, therefore, that in the warmer climates, where winter is mild and short, this occurs; but in France and England they are torpid.

ANTS are of two or three kinds; some red, some black, some with stings, and others without. By their stings some inflict wounds; others spurt from their hinder parts an acid pungent liquor, which inflames and burns the skin like nettles.

An ant is divided into the head, breast and belly. In the head, are the eyes, black: under the eyes two small horns or feelers, of twelve joints, covered with a fine silky hair. The mouth has two crooked jaws, projecting outwards, serrated like teeth. The breast is covered with fine silky hair; from it project six legs, strong and hairy, their extremities armed with two small claws, which the animal uses in climbing. The belly reddish, the body brown chestnut colour, shining, and covered with extremely fine hair. This animal is bold and active, and fears not to attack creatures ten times its own magnitude. In the first fine day of April, the ant-hill swarms with life, and myriads awaking from their annual lethargy, prepare for the occupations of the season. At first none but the wingless tribe appears; these are the working ants: the males and females, that have four large wings, are slower in their appearance. Thus, like bees, they are divided into males, females, and neutrals. The females are much the largest; the working ants the smallest. The female also differs by the colour and structure of her breast, which is a little browner than the common ant, and brighter than the male. In eight or ten days after their appearance, their labours are in some forwardness.

wardness. The males partake not in the drudgeries of the state, but pursue the females with great assiduity.

In England, ant-hills are formed with but little regularity. In the south of Europe they offer a sight highly worthy curiosity. They are generally in the neighbourhood of some large tree and a stream of water. The first, as a proper place for getting food; the other, for supplying moisture. The ant-hill resembles a sugar-loaf in shape, three feet high, composed of leaves, wood, sand, earth, gum, and grains of corn, united compactly, with galleries to the bottom, and winding ways within. To the water, and to the tree, are many paths worn by constant assiduity; along these the busy insects pass and re-pass continually from May till the autumnal bad weather.

Their chief employment is procuring a sufficiency of food for all the community. They live on various provision, small insects, sweets of all kinds. They seldom think of the community, till themselves are first satiated. Having found a juicy fruit, they swallow what they can, then tearing it in pieces, carry home their load. If they meet with an insect above their match, several will fall on it at once, and each will carry off part of the spoil. If they meet any thing that is too heavy for one, several will unite their force, some dragging, others pushing. If one makes a lucky discovery, it will give advice to others, and the whole republic will put themselves in motion at once. If one is killed, some will carry him off to a great distance, to prevent obstruction to the general spirit of industry.

After a few days of fine weather, the female ants lay their eggs. They are carried, as soon as laid, to the safest situation at the bottom of their hill. The egg is so very small, that, though laid on a black ground, it can scarcely be discerned. If viewed through a microscope, it appears smooth, polished, and shining; the maggot is composed of twelve rings, is often larger than the ant itself, and found frequently as a white substance in every ant-hill. In cold weather they take them in their mouths to the very depths of their habitation; in a fine day they remove them, with equal care, nearer the surface, for the warm beams of the sun. If a formidable enemy should come to attack their habitation, their first care is to save their offspring, each loaded with a young one, often bigger than the insect that supports it.

When the young maggot acquires its full growth, it becomes an aurelia, which represents distinctly the parts of the animal, though without motion, and wrapped up. After all its changes, it bursts this last skin,

to assume the form it is to retain. The old ones very assiduously break open with their teeth the covering in which it is inclosed; knowing the precise time for their assistance: if produced too soon, the young one dies of cold; if retarded too long, it is suffocated.

When the female has done laying, her wings drop off; but the males, having no longer any occupation at home, use their wings, and fly away.

The working ants prepare for winter, and bury their retreats deep; their stock of corn, and other substances, serve as fences to keep off the rigours of the weather in our cold climates, not as provisions, they being torpid: but whether without any intervals may be questioned. What has been said mistakenly of our European ant, is true of those in tropical climates. They build hills with great contrivance and regularity, lay up provisions, probably live the whole year, and submit to regulations unknown among the ants of Europe.

In Africa are some ants white, others red, green, or black; the latter exceed an inch long, in every respect formidable. Their sting is extremely painful, and their depredations sometimes extremely destructive. Their hill is from six to twelve feet high, made of viscous clay, tapering pyramidally, constructed with great artifice; the cells so numerous and even, a honey-comb scarce exceeds them in number and regularity. The inhabitants seem to be under strict regulation. At the slightest warning they sally out on whatever disturbs them. Sheep, hens, rats, and even large animals, are destroyed by these merciless insects, and their flesh devoured to the bone. No anatomist in the world can strip a skeleton so clean; no animal, how strong soever, when once seized, has power to resist them. When they sally forth, fifty or sixty larger than the rest head the band, and conduct them. If they have a fixed spot where their prey continues to resort, they form a vaulted gallery, sometimes a quarter of a mile in length; and yet they will hollow it out in the space of ten or twelve hours.

The millions of these insects, their voracity, their union, and management, far exceeds what we can conceive: but by supposing our ants enlarged in size and powers, and increased in numbers, so that a train might be a mile long, and very broad, we may form some idea of the African termites, and the South American troops of insect depredators, from which scarce any living thing can escape but by flight.

T H E B E E T L E.

OF the BEETLE are various kinds ; all having cases to their wings, which are the more necessary, as they live under the earth in holes which they dig, to prevent the injuries of their real wings, which they keep clean and even : they produce a buzzing noise, when the animal flies. Bulk for bulk, these insects are a thousand times stronger than man. Some beetles are not larger than the head of a pin, others as big as one's fist : some are produced in a month, and in a single season go through all the stages of their existence ; others take near four years to their completion, and live as winged insects another year.

The MAY-BUG, or DORR-BEETLE, has cases of reddish brown colour, sprinkled with whitish dust, which easily comes off. Of some the necks are covered with a red plate, others with a black. The fore legs are very short, for burrowing in the ground, where it retreats. Is well known for its evening buzz ; has been known to swarm in such numbers, as to eat up every vegetable production. The sexes are distinguished by the superior length of the tufts at the end of the horns, in the male. They unite in summer. The female bores a hole in the ground, to deposit her burthen, half a foot deep ; here she places her eggs, one by the other. They are oblong, bright yellow. She ascends from her hole, to live as before, on leaves and vegetables, to buzz in the evening, and to lie hid, among the branches of trees, in the heat of the day. In three months the egg vivifies, the insect breaks its shell, and a small grub or maggot crawls forth ; it continues in the worm state more than three years, devouring the roots of plants, and making its way under ground : they grow to the size of a walnut, being a great whitish-yellow maggot with a red head, found frequently in new turned earth, and eagerly sought after by birds. The body consists of twelve segments or joints, on each side of which are nine breathing holes, and three red feet. The head is large, reddish, a pincer before, and semicircular lip, with which it cuts the roots of plants, and sucks their moisture. It has no occasion for eyes, and has none, but two feelers serve to direct its motions. It yearly changes its skin.

In the fourth year, about the latter end of autumn, the grub approaches its transformation, buries itself, sometimes six feet beneath the surface, and forms

forms a capacious apartment, which it renders very smooth by the excretions of its body. It begins soon after to shorten, swells, and bursts its skin, to become a chrysalis, at first yellowish, but at last nearly red. After three months, in January, the chrysalis becomes a winged insect, but continues feeble and sickly. Its parts are soft, and its voracious nature suspended. In May it bursts from the earth, the first mild evening, to visit the softness of the summer air, to choose the sweetest vegetables, and to drink the dew of the evening, buzzing along by thousands, and hitting every object that intercepts their flight. At mid-day they lurk under leaves and branches, the willow particularly, in clusters. They never survive the season. They unite speedily.

The female bores a hole in the ground, with an instrument at the tail, and deposits her eggs. This insect, in its worm state, makes one of the chief repasts of the feathered tribe, and generally the first nourishment with which they supply their young. Rooks and hogs are particularly fond of these worms. Of all the beetle kind this is the most numerous, and may serve as a specimen of the rest; but all are not so long in the worm state, a single year sufficing.

That beetle which the Americans call the TUMBLE-DUNG, is black, rounder than most, and so strong, though not much larger than the common black beetle, that if one of them be put under a brass candlestick, it will move it backwards and forwards, as if by an invisible hand; to the admiration of those not accustomed to the sight; their excellent smelling directs them in flights to excrements just fallen from man or beast, on which they instantly drop, forming round balls or pellets, in which they lay an egg. These pellets, in September, they convey three feet deep in the earth, where they lie till spring; when the eggs are hatched, the nests burst, and the insects appear. They assist each other with indefatigable industry, in rolling these pellets with the tail foremost, raising up their hinder part, and shoving along the ball with their hind feet. They are always accompanied by other beetles, larger, more elegant in structure and colour. The breast covered with a crimson shield, shining like metal; the head is crimson mixed with green; on the crown of the head a shining black horn, bending backward. These are named kings of the beetles, but partake of the same dirty drudgery.

The Elephant-beetle is the largest known; inhabits South America, particularly Guiana and Surinam, and the river Oroonoko; is black, covered with a very hard shell, full as thick and strong as a small crab. Its length four inches. The breadth of the body two inches and a quarter; the breadth of each *elytron* or case for the wings, an inch and three tenths.

The *antennæ*, or feelers, are horny, almost an inch long, pointed; the proboscis is moveable at its insertion into the head, and seems to supply the place of feelers. The proboscis an inch and quarter long, turns upwards, terminating in two horns, each near a quarter of an inch long; but not perforated at the end like the proboscis of other insects. About half an inch above the head, next the body, is a prominence, or small horn, which, if the rest of the trunk were away, would cause this part to resemble the horn of a rhinoceros. [There is a beetle so called, but then the horn or trunk has no fork at the end, though the lower horn resembles this.] The feet are all forked at the end, but not like lobsters claws. It is impossible to describe the brilliancy of many foreign beetles; they seem composed of all kinds of gems and precious stones, each vying with the others for splendour: their beauty is not to be distinctly understood without magnifying-glasses, under which the BRAZIL BEETLE is a most delightful object; every part of him being studded with surprising elegance; is rare, and often sold for two guineas.

To this class we may refer the GLOW-WORM. No two insects can differ more than the male and female. The male is a beetle, having cases to its wings, and flying at pleasure; the female is entirely a creeping insect, and waits the approaches of her companion. The body of the female has eleven joints, a shield breast-plate, oval; the head over this very small; the three last joints of her body yellowish: but what distinguishes her, in this part of the world, is the shining light she emits by night, and which is supposed to be an emanation of allurements to her companion. In sandy countries the ditches are studded on each side of the road by her shining sparks. If kept for some time its light grows paler, and at last expires. It is probable this light is electrical.

In tropical climates this peculiarity is very greatly exceeded: the light from fire flies, lanthorn flies (whose light is in their head), and many others, is surprising; it is probably for the same purpose, and produced on the same principle, greatly exalted.

The CANTHARIS, or *Spanish Fly*, is of the beetle kind, has feelers like bristles, flexible cases to the wings, a breast pretty plain, and the sides of the belly wrinkled; they differ in size, shape, and colour; the largest are an inch long, and as much in circumference; some are pure azure, others pure gold, others a mixture of pure gold and azure; all are very brilliant and beautiful. They are chiefly natives of Spain, Italy, and Portugal. They are fond of ash-leaves, and will sometimes strip a tree bare. Some affirm, that they delight in sweet-smelling herbs; they are fond of honey-suckles, lilac, and wild-cherry shrubs. The country people expect their

return every seven years. Such numbers of these insects have been seen together in the air, that they appeared like swarms of bees; they have so disagreeable a smell, that it may be perceived a great way off, especially about sun-set, though they are not seen. When caught and dried, they are so light, that fifty will hardly weigh a dram. They kill them with vapours of hot vinegar, after which they dry them in the sun, and keep them in boxes; they are penetrating, corrosive, and, applied to the skin, raise blisters.

The KERMES is produced in the excrescence of an oak, called the berry-bearing ilex; is at first wrapt in a membranaceous bladder, the size of a pen, smooth, shining, brownish red, covered with very fine ash-coloured powder. This bladder in May or June teems with a number of reddish eggs or insects, which being rubbed emit a crimson liquor. In April this insect is the size and shape of a pea; its eggs soon after burst from the womb, and becoming worms, run about the tree: such are the females. The males are a sort of flies like gnats, with six feet, the four forward short, the two backward long, divided into four joints, and armed with three crooked nails, two feelers on the head, moveable, streaked, and articulated, a quarter of an inch long; the tail very short, forked. The whole body is covered by two transparent wings, and they leap about like fleas. The women gather them before sun-rising, tearing them off with their nails, for fear there should be any loss from their hatching. They sprinkle them with vinegar, and lay them in the sun to dry, where they acquire a red colour.

The COCHINEAL INSECT is oval, the size of a small pea, with six feet, and a snout or trunk; brings forth its young alive; is nourished by sucking the juice of a plant. Its body consists of several rings, and when once fixed on the plant, it continues immoveable, being subject to no change. There are two sorts, the domestic and the wild; the wild feeds on uncultivated trees, but the domestic is carefully attended and removed to cultivated trees of the prickly pear-plant, and defended from other insects. When the rains and cold weather are coming on, they take off the leaves or branches covered with cochineal, not yet at perfection, and keep them in their houses. These leaves are very thick and juicy, and supply them nourishment. When milder weather returns, and they are about to exclude their young, the natives make them nests of tree-moss, or soft hay, or the down of cocoa-nuts, placing twelve in every nest. These they fix on the thorns of the prickly pear-plant; in

three or four days they bring forth their young, which leave their nests in a few days, and creep on the branches of the plant, till the females are visited by the males, which are winged insects; they produce a new offspring yielding a new harvest thrice a year. When gathered, they put them into holes in the ground; they are killed with boiling water, and dried in the sun, or on hot plates. From the various methods of killing them arise their different colours when brought to us.

It is evident that the foregoing (like the following) are not beetles, as they do not undergo the changes, &c. which belong to that tribe; yet, on the whole, this may be as convenient a place as any for them to occupy.

GALL INSECTS are bred in excrescences, adhering to a kind of oak in Asia, which differ in colour, size, roughness, and shape; these we call galls. The female of this animal is furnished with an implement, by which she penetrates into the bark of the tree, or into a spot which just begins to bud; and there sheds a drop of corrosive fluid. She deposits her eggs in the place. The juice or sap fermented by the wound and fluid, turned from its natural course, flows round the egg; after which it is swelled by bubbles of air. The external coat of thick excrescence is dried by the air, and grows like a kernel, receiving nutriment slowly. The worm that is hatched under it finds in its substance, which is tender, a subsistence till the time for its transformation to a nymph, and from that changes to a fly, and rises into the air. The gall-nut that grows in autumn is surprised by the cold weather before the worm is transformed to a fly, the nut falls with the leaves, and the fly passes the winter in a shelter, where every crack and cranny is well stopped up, which preserves it from the injuries of the weather. Here it acquires its perfect state, and, roused by the first heats, breaks its way through.

THE GNAT AND THE TIPULA.

THEIR differences of form are so very minute, that it is difficult to distinguish one from the other: they have both long legs, two wings, and slender body; their heads large, they seem hump-backed; but the tipula wants a trunk, while the gnat has a large one. The tipula harmless and peaceful; the gnat sanguinary and predaceous.

The gnat proceeds from a little worm, at the bottom of standing waters. Its eggs, after being laid on the surface of the water, are surrounded by

The Tufted Gnat.

Magnified

by an unctuous matter, which prevents their sinking; but they are fastened with a thread to the bottom, to prevent their floating away. Thus the insects, in their egg state, resemble a buoy fixed by an anchor. As they come to maturity, they sink, and when they leave the egg as worms, they creep at the bottom. They make lodgments of cement, which they fasten to some solid body at the bottom, unless by accident they meet with a piece of chalk, which being of a soft nature, affords opportunity of sinking a retreat for themselves, where nothing but the claws of a crayfish can possibly molest them. The worm afterwards appears with a large head, a hairy tail, moistened with an oily liquor, which she uses as a cork, to sustain her head in the air, and her tail in the water, and to transport her from place to place; this liquor she discharges out of her mouth. The gnat, in her second state, is properly a nymph, which is an entrance to a new life. In the first place she divests herself of her second skin; in the next she resigns her eyes, antennæ, and tail, and seems to expire; but from her spoils rises a little winged insect, whose structure is a just object of admiration. Its little head is adorned with a plume, and its whole body invested with scales and hair. The little border of fine feathers, which graces her wings, is very curious: her trunk may justly be deemed one of Nature's master-pieces. It is so very small, that the extremity of it can scarcely be discerned through the best microscope. That part which appears is but a long scaly sheath under the throat. At near the distance of two thirds of it is an aperture, through which the insect darts four stings; one of which is the case in which the other three lie concealed, and run in a long groove. Their sides are sharpened like two-edged swords; they are barbed, and have a vast number of cutting teeth toward the point, which turns up like a hook, and is surprisingly fine. These darts struck into the flesh of animals, sometimes one after another, sometimes all at once, extravasate the blood and humours. When the gnat, by the point of her case, which she uses as a tongue, has tasted any fruit, flesh, or juice, if it be fluid, she sucks it up, but if solid, she pierces it, draws back her stings, and by their sheath, which she applies to the wound, extracts the juices. Winter she passes in quarries or caverns, which she abandons at summer, and flies to some ford, or standing water, where she may produce her progeny, which would be soon washed away by the too rapid motion of any running stream. The little brood are sometimes so numerous, that the very water is tinged according to their colour.

Very extraordinary circumstances are reported of the gnat, and indeed

barely credible. Some are oviparous ; some viviparous ; some males, and unite with the female ; or females, requiring the male ; some are of neither sex, yet produce young without assistance. A gnat inclosed alone in a glass vessel, with air to keep it alive, shall produce young, which also, when separated from each other, shall be parents of a numerous progeny, the young bursting from the body of their parents without previous impregnation. At the sixth generation this stops, the gnat no longer produces from itself alone, but requires the male to bestow another succession of fecundity.

In America, where the waters stagnate, and the climate is warm, gnats are produced in multitude of multitudes ; the whole air filled with clouds of all sizes, from six inches long to minuteness itself. The mid-day sun is too powerful for them ; but during evening nothing can shield the wretched inhabitants from their attacks ; though millions are destroyed, millions more succeed, in unceasing torrents. The native Indians, who anoint their bodies with oil, and have been used to their depredations, find them much less inconvenient than Europeans ; they sleep covered with thousands. If a candle be lighted in these places, a cloud of insects lights on the flame, and extinguishes it ; so that they are obliged to keep their candles in glass lanthorns. Nor is it a little extraordinary that the same multiplication of the gnat kind should occur in Lapland, where those gentlemen who went to measure a polar degree were extreme sufferers by heat and insects : while those engaging in measuring an equatorial degree were perished by storms, snows, and cold.

Such are the ways of Nature, as exemplified in the tribes of insects. We have seen other creatures transformed, but not so often ; nor after equally apparent dissolution. Among so numerous a tribe it is difficult to form a just selection, which may include all their various ways of obtaining life ; and perhaps some may exist whose transformations may be yet more numerous and peculiar, their manners and properties more remarkable and wonderful : for certainly thousands are unknown to us in countries where study and learning have not penetrated, and of which our information is extremely limited ; not to mention the difficulty of accurate acquaintance with those more immediately subject to our notice, arising not less from their modes of life, than from their unlikeness in different states.

WORMS AND ZOOPHYTES.

THE LEECH

HAS great reputation for its phlebotomical services, being esteemed the best of blood-letters; and as such known to the ancients. **PLINY** names it the *hirudo sanguisuga*; was used instead of cupping glasses for persons of a full habit of body, or goutical. There are several sorts, all strongly allied to worms. In general the body oblong; moves by assuming an arch-like form; takes its food entirely by suction; and what is very remarkable, has no visible ejection to discharge it after digestion; it is therefore by most naturalists supposed to pass through the pores of its skin, perhaps somewhat in the nature of perspiration. They have been kept long in glasses without in the least discolouring the water, or causing any sediment. Kept in glasses they are good barometers, and predict bad weather by their restlessness and perpetual change of place; they live long without food, thus kept. They inhabit standing waters generally, and perhaps by preference, though I have caught them in shallow running streams. When placed in the middle of such a stream, they adhere by suction at the tail to whatever they find; yet often the current is too strong for them. In some places abroad they swarm so prodigiously, as to deter the inhabitants from venturing into many pieces of water; for such numbers would attack them, as would drain them quickly of their blood; by their strong adhesion they are difficult to get rid of, and sometimes leave dangerous wounds, of which circumstance there are accounts.

The **MEDICAL LEECH** has a brown body, marked with six yellow lines, belly lighter. The *Horse Leech* has a flattish body; in the bottom of the mouth certain great sharp tubercles; is slenderest about the mouth; thickest towards the tail; the tail slender; belly yellowish-green; back dusky. The sea furnishes a kind or two that greatly infest fish. That kind used medically is said to fasten where a spot is rubbed with blood or milk, and to discharge what it has swallowed, if sprinkled with salt. In most particulars conformable to worms, but not capable of propagation by being cut in pieces.

WORMS,

BEING destitute of feet, trail themselves along on the ground, and inhabit the earth, or the water; though they creep along the earth on their bellies, yet their motions are very different from

those of serpents. There is a spiral muscle that runs round the body, from head to tail, somewhat resembling a wire-spring to a bell which is hung from room to room; which, if one end be extended and held fast, will bring the other nearer to it: by this the earth-worm, having extended itself, holds by the slime of the fore part of its body, then contracts itself and brings forward the hinder part.

Its body is armed with small stiff sharp burs or prickles, which it can erect or depress at pleasure; under the skin lies a slimy juice, ejected as required, at certain perforations, between the rings of the muscles, to lubricate its body, and facilitate its passage into the earth. It has breathing-holes along the back, adjoining each ring. Destitute of head, ears, nose, for the most part of eyes, and properly without feet. It has a mouth, and an alimentary canal, which runs to the very point of the tail (but in some found in the bodies of animals, this canal opens towards the middle of the belly), filled with a very fine earth, which seems to be their nourishment.

Without brain, but near the head is the heart, which beats distinctly; round it are the spermatic vessels, forming a number of little globules, containing a milky fluid, opening into the belly, not far from the head: they are also often found to contain eggs, which are laid in the earth, and hatched in twelve or fourteen days, by the warmth; like snails, these animals unite in themselves both sexes.

The young ones are very small, but perfectly formed, and suffer no change: how long they live is not known, certainly more than two or three seasons. During winter, they bury themselves deep, and seem to share the general torpidity. In spring they revive, a moist or dewy evening brings them from their retreats, for mutual intercourse. They chiefly live in a light, rich, and fertile soil, moistened by dews or accidental showers, but shun where the water is apt to lie, or the clay is too stiff. They avoid the mole, who feeds on them, by darting up from the earth, the instant they feel the ground move; and fishermen take them in numbers, by stirring the earth.

The EARTH-WORM continues to live, though cut in separate parts. We owe the discovery of this power of reproduction in animals to Mr. Trembley, who first observed it in the polypus; after him, Spallanzani and others found it in the earth-worm, the sea-worm, and several other animals. Every earth-worm, however, did not retain the vivacious principle equally; some, when cut in two, were destroyed; of others, while the head was living, the tail perished, and a new tail came at the extre-

mity. In the small red-headed earth-worm, both extremities survived the operation; the head produced a tail with the anus, the intestines, the annular muscle, and the prickly beards; while the tail in less than three months sent forth a head, heart, and instruments of generation. This part was produced slowly, a new head taking three or four months for its completion, a new tail not so many weeks.

The SEA-WORM, the white water-worm, and many of those little worms with feelers, found at the bottom of dirty ditches, are capable of the same.

THE STAR-FISH; OR SEA-BLUBBER.

THIS is a numerous tribe, shapeless and deformed, assuming at different times different appearances; now round like a ball, shortly after as thin as a plate. This kind are formed of a semi-transparent gelatinous substance, covered with a thin membrane, and often appear like a lump of jelly, floating at random on the sea, or thrown by chance on the shore; yet they possess life and motion, and shoot forth arms in every direction to seize on such insects as are near. Worms, fish spawn, even mussels, with their shell, have been found in the stomachs of these animals, which are no way injured by swallowing such hard substances.

In summer, when the water of the sea is warmed, they float, and in the dark emit a kind of shining light resembling phosphorus. Some call them sea-nettles, because they sting the hands of those that touch them, like nettles. They are often seen fastened to the rocks, and to the largest sea-shells. If put into spirit of wine, they will continue many years entire; but if left to the influence of the air, they are, in less than four and twenty hours, melted down into limpid and offensive water.

None possesses other vent for excrements but the same passage by which they devour their food: in general they resemble a truncated cone, its base applied to the rock to which they are usually attached. Though generally transparent, yet they are of different colours, some inclining to green, or red, or white, or brown. In some, the colours appear diffused, others are often streaked, and others spotted. Many of them possess a number of long slender filaments, in which they entangle small animals,

mals, and thrust them into their enormous stomachs, which fill the whole cavity of their bodies. The harder shells continue for some weeks indigested, but at length they undergo a kind of maceration, and become a part of the substance of the animal.

They may be cut in pieces, and every part will survive the operation; each becoming a perfect animal, endued with its natural rapacity.

The CUTTLE-FISH is about two feet long, covered with a very thin skin, its flesh composed of gelatinous substance, within strengthened by a strong bone. It has eight arms, capable of lengthening or contracting at pleasure; when dead, they become rigid. They feed on small fish, which they seize with their arms; they are bred from eggs, which are laid upon the weeds along the sea-shore.

The cuttle-fish is found on many coasts of Europe, but not easily caught, being furnished by Nature with a black substance contained in a bladder generally on the left side of the belly, and which is ejected in the manner of an excrement. Whenever this fish is pursued, and it finds a difficulty of escaping, it spurts forth a great quantity of this inky liquor, by which the water is darkened, and it escapes, by lying close at the bottom.

THE POLYPUS.

THE moderns have given the name POLYPUS to a little fresh-water creature, found at the bottom of wet ditches, or attached to the under surface of the broad-leaved plants that grow on the waters. Sea-Polypi, which were well known to the ancients, are from two feet long to three or four; and Pliny has described one, whose arms were thirty feet long. Our ditch-water Polypi seldom exceed three parts of an inch long, and when gathered up, not a third of those dimensions, but in form they resemble the larger.

To Mr. Trembley we owe the discovery of the amazing properties and powers of this little vivacious creature: he divided this class of animals into four different kinds, according to their colours, green, brownish, flesh colour, and tufted.

They appear in a wet ditch like little transparent lumps of jelly, the size of a pea, flattened on one side; the under side of broad-leaved weeds

The Cuttle-fish.

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on the surface of the water, is often studded with a number of these little jelly-like substances, which are polypi gathered up into a quiescent state. In action they assume a very different appearance; the finger of a glove, cut off at bottom, with several threads round the edge like a fringe, will give us an idea of the stomach of the animal, and its arms or feelers. It has neither muscles nor rings: its manner of lengthening or contracting itself most resembles that of the snail; it contracts itself in proportion as it is touched, or as the water is agitated. Warmth animates, and cold benumbs them; but a degree of cold approaching congelation only reduces them to perfect inactivity: their arms are double (often thrice) as long as their bodies; these are thrown about in various directions to seize its prey; sometimes three or four are employed, while the rest are contracted, like the horns of a snail, within the animal's body. It seems capable of giving what length it pleases to these arms, and stretches them in proportion to the remoteness of the object it would seize.

They go from one part of the bottom to another; they mount along the margin of the water, and climb the sides of aquatic plants. They often come to the surface of the water, where they suspend themselves by their lower end. They advance very slowly, employ a deal of time in every action, and bind themselves very strongly to whatever body they meet as they proceed; their adhesion is voluntary, and probably performed in the manner of a cupping-glass.

They have a remarkable attachment to turn towards light, yet no eyes have ever been discovered by the best microscopes.

In the center of the arms the mouth is placed, serving at once as a passage for food, and an opening for it after digestion. The inward part of the animal seems to be one great stomach, open at both ends; but the purposes of the opening at bottom are unknown, unless it be of adhesion. The surface of the body of this little creature, examined with a microscope, appears studded with a number of warts, as also the arms, especially when contracted.

They chiefly subsist on insects less than themselves, particularly a kind of water-millepedes, and a very small red worm, which they seize with great avidity. Wherever its prey is, which the animal finds by feeling, a touch fastens the object it would seize beyond escape. The greater its distance, with the greater ease the Polypus brings the prey to its mouth. If the little object be near, though irretrievably caught, it is not without great difficulty it can be brought to the mouth and swallowed.

When the Polypus is unsupplied with prey, it testifies its hunger by opening its mouth: the aperture, however, is so small that it cannot be easily perceived; but when, with any of its long arms, it has seized its prey, it then opens the mouth distinctly enough, and always in proportion to the size of the animal it would swallow; the lips dilate insensibly, and precisely to the figure of their prey. Mr. Trembley found they could devour aliments of every kind, fish and flesh as well as insects. When he gave one of these famished reptiles any substance which was improper for aliment, at first it seized the prey with avidity, but, after keeping it some time entangled near the mouth, let it drop again with distinguishing nicety.

When several polypi happen to seize the same worm, they dispute their prey. Two are often seen seizing the same worm at different ends, and dragging it at opposite directions with great force. Often they continue swallowing each his part, till their mouths meet; then they rest till the worm breaks; but it often happens, when the mouths of both are thus joined, the larger polypus gapes and swallows his antagonist, which, after it has lain in the conqueror's body an hour, issues unhurt, and often in possession of the prey contended for.

They continue eating the whole year, but when the cold approaches to congelation, then they feel the general torpor, and their faculties are for two or three months suspended. The meal of one day suffices them several months. In general they devour in proportion to their size, and their growth is quickest as they are best fed.

They are produced in as great a variety of manners as a vegetable. Some polypi from eggs, as plants from seed; some by buds, as plants by inoculation; all may be multiplied by cuttings, and this to minuteness beyond expectation.

In summer, a polypus exhibits in different parts of its body tubercles or little knobs, which enlarge daily, and, after two or three days, take the figure of a small animal, resembling its parent, furnished with feelers, a mouth, and apparatus for seizing and digesting its prey: this daily becomes larger, like the parent, to which it continues attached; spreads its arms to seize whatever is proper for aliment, and devours it for its own particular benefit; thus it possesses two sources of nourishment, that which it receives from the parent by the tail, and that which it receives from its own industry by the mouth. The food which these animals receive often tinctures the whole body, and the parent is seen communicat-
ing

ing part of its fluids to its progeny that grows on it. Several young ones are thus seen at once, of different sizes, growing from its body; some just budding, others acquiring their form, and others come to maturity, just ready to drop from their original stem. Young ones, while attached to their parent, propagate their own young ones also, each in the same dependence on its respective parents, and possessed of the same advantages as have been described.

It is indifferent whether one of them be cut into ten, or ten hundred parts, each becomes a perfect animal; but the smaller part thus separated will be longest in coming to maturity. The animal has been twisted and turned into all manner of shapes; has been turned inside out, and cut in every division, yet still it continued to move, its parts adapted themselves again to each other, and in a short time it became as voracious and industrious as before.

Besides these kinds mentioned by Mr. Trembley, there are others which have been since discovered by the vigilance of succeeding observers; some of these so strongly resemble a flowering vegetable in form, that they have been mistaken by many naturalists. Mr. Hughes, in his Natural History of Barbadoes, has described a species of this animal, but called it a *sensitive flowering plant*; he observed it to take refuge in the holes of rocks, and, when undisturbed, to spread forth a number of ramifications, each terminated by a flowery petal which shrunk at the approach of the hand, and withdrew into its hole. This *plant* however was a polypus, not only found in Barbadoes, but on the coast of Cornwall, and the shores of the Continent.

LITHOPHYTES AND SPONGES.

THE animals we see, much less those we are acquainted with, bear no proportion to those concealed from us. Though every leaf and vegetable in the air swarms with animals, yet in the water they are still more abundant, and at sea absolutely innumerable: the greatest part of what seem vegetables growing in the deep, are but the artificial formation of insects, and built for their own habitation.

The bottom of the sea along some shores, and at the mouths of several

ral rivers, has the appearance of a forest under water, millions of plants growing with their branches entangled in each other, sometimes so strongly as to obstruct navigation. The Persian gulph, the Red sea, the Western coasts of America, are choaked up in many places with coralline substances; though ships force a passage through them, they are impracticable to boats and to swimmers.

Corals sometimes shoot out like branches of trees, or a broad surface like a fan, or a large bundling head like a faggot; sometimes they resemble a plant with leaves and flowers; often the antlers of a stag. Elsewhere in the sea are seen sponges of various magnitude, and extraordinary appearances, assuming phantastic forms like mushrooms, mitres, fonts, flower-pots. These productions seem entirely vegetable; but the ingenious Mr. Ellis, by sagacious and diligent enquiry, determined that corals and sponges are the work of animals, and (like the honey-comb) coral was produced by an infinite number of associates; these are of the polypus kind, whose united labours fill tracts of ocean with these tokens of their industry.

Should we be induced to break off a branch of the coralline substance from its original connection, we shall perceive its whole surface, which is very rugged and irregular, covered with a mucous fluid, almost in every part studded with little jelly-like drops: these closely examined prove to be of the polypus kind; have motions, arms, and appetites exactly resembling those already described; but they soon expire when taken out of the sea.

A coralline plant, strictly observed while growing, if not disturbed, the little polypi will be seen in infinite numbers, each issuing from its cell, and in some kinds the head covered with a little shell, resembling an umbrella, the arms spread abroad to seize its prey, while the hinder part remains attached to its habitation, from whence it never wholly removes. All are assiduously employed in the same pursuits.

Mr. Ellis examined their operations just as they were beginning. In a neglected oyster-bed he perceived the first rudiments of a coralline plantation, and tufts of various kinds shooting from different parts. He took out the oysters thus furnished with coralines, and placed them in a large wooden vessel, covering them with sea-water. In about an hour he perceived the animals, which before had been contracted by handling, and had shewn no signs of life, expanding themselves in every direction, and employed in their own natural manner. To preserve them thus expanded, so as to be permanent objects of curiosity, he poured, by slow

degrees,

degrees, an equal quantity of boiling water into the vessel of sea-water. He then separated each polypus with pincers from its shell, and plunged each separately into small crystal vases, filled with spirit of wine mixed with water. By this means the animal was preserved entire, without having had time to contract itself; and thus he perceived a variety of kinds, almost equal to that variety of productions which these little animals form. He perceived and described fifty kinds, each possessing its peculiar mode of construction, and forming a coralline none of the rest can imitate. On every coralline substance are a number of polypi, not resembling the erectors of the building, but a vagabond race.

In general the same difference that subsists between the honey-comb of the bee, and the paper-like cells of the wasp, subsists between the different habitations of coral-making polypi. They have been named by their likeness to some well-known object, such as coralines, fungi, madre-pores, sponges, astroites, and keratophytes. Though these differ extremely in their outward appearances, they all are formed in the same manner by polypi of various kinds and nature. When examined chemically, corals dissolve in acids, and sponges burn with an odour strongly resembling that of burnt horn.

Probably the substance of coral is produced, like the shell of a snail, from a slimy matter, which covers its body, and hardening, becomes an habitation; several of these united, form at length a considerable mass.

Minute and diminutive as some of those creatures seem to whose manners we have paid attention, they are large when compared to others, of whom we have information, but whose natures are greatly concealed by their smallness. Among the most remarkable of these are,

EELS IN PASTE.

FLOUR and water boiled together till moderately consistent, and exposed to the air in an open vessel, after some days (if not mouldy) will turn sour, and exhibit multitudes of long, slender, wriggling animalcula, not always invisible to the naked eye. They may be kept a year, by supplying a drop of vinegar, or water, occasionally; these are viviparous, and many young are found in the body of the parent, each coiled up and included in its proper membrane, to the number of an hundred.

How far the former are related to *eels in blighted wheat* is dubious:
these

these are lodged in grains that appear blackish, as if scorched, and when opened contain a soft white substance, like a number of threads lying beside each other, which, if wetted while fresh, separate, and discover themselves to be living creatures. At first, their motions are languid, but gradually they become invigorated, yet always move somewhat slowly, and with regularity; bending their extremities sometimes differently, sometimes alike. If the grains of wheat are dry, and opened while dry, and the thread-like matter be put into the water, often the whole miscarry; but if they be previously steeped in water, or buried in the earth, so that they moisten gradually, then, after being opened, and the water admitted to their contents, in the course of a few hours they revive, and become lively. This has been ascertained after the grains had been dry for four or more years. If the husks be left in much water, the eels quickly die; but if removed they live several months, and should the water dry away, are revived by a fresh supply; if left in the husks they perish, having no powers yet known whereby to open their prisons. There are some differences between these eels and those of paste; what is their real relation we know not.

Pepper-water yields a great variety of minute insects, even though the pepper has been preserved many years. Common black pepper grossly pounded, put into an open vessel, and water poured on it, and the mixture well shaken, will in a few days be covered by a pellicle reflecting the prismatic colours: this contains millions of creatures at first very small, but increasing daily in size and numbers, till the whole fluid seems alive. Their kinds are very various; some are swift and agile, seeming in continual chase of prey, can creep as well as swim, are fringed all round their bodies; others have globular bodies and long tails; others resemble flounders; others worms; of some an hundred placed in a row would not equal in diameter a grain of sand.

Nor is this effect peculiar to pepper: hay, straw, oats, barley, or any other vegetable, infused in like manner, will furnish a scum, which, on examination, proves to be, or to contain, living creatures in prodigious numbers; some of the same sort as those in pepper-water; others totally different, and peculiar to the plant infused; some resembling serpents in form and motions, coiling themselves round in like manner. Eel-like animals are frequent among them.

Vinegar also abounds with eel-like creatures, after having stood a few days uncovered, in the summer season. Of these it is remarkable, that if the vinegar be but moderately heated by the fire, they die and fall.

to the bottom; but cold does not hurt them. If frozen and thawed repeatedly, they repeatedly revive and become brisk; if a quantity of oil be poured on the vinegar, they creep up into the oil when the vinegar begins to freeze, and return to the vinegar when that is thawed. By a few grains of sand put among them they are greatly embarrassed, and are in a manner overwhelmed by such huge stones.

RAIN WATER, after standing a few days, exhibits similar appearances; water in ditches and water that drains from dunghills is often so crowded with animals, as to seem all alive, especially the deep brown water from dunghills. It is probable that some of these animalcula are extremely minute flies in their worm state, and undergo one transformation, if not more, ere they become perfect; others are unquestionably in their perfect state, here breed, live, and die, without change. The infinite variety of their forms, motions, parts, and contrivances for catching prey, is unlimited. Some of them are congregated in millions of millions to an inch square, under the appearance of mud, or weeds, or slime in ditches: of all colours, especially blackish-green. Some are like worms, having membranous coverings; other shelled like mussels, or cockles: some seem capable of varying their forms, seeming now rounded, now lengthened, now with a long neck, now with quite a different conformation; many of them resemble such insects as are familiar to us, and are like them crustaceous, have feelers, legs, tails, &c. Usually the microscope shews that their internal conformation is not altogether unlike, and we conceive of them as having the same parts in a general idea, but inexpressibly smaller. Crabs and lobsters in form, and perhaps in manners (so far at least as having spawn under the tail, or in receptacles on each side of it), are common among them; and it is not impossible they also change their skins.

In general these minute insects may be referred to, (1.) Those which infest other animals, for there is no animal we know but has its plague of this kind, as well fish as beasts and birds. (2.) Those infesting vegetables, which are as numerous and different as vegetables themselves. (3.) Those found in fresh waters, rivers, drains, cuts, ditches, and standing waters; not a place without some kind, which there inhabits and breeds; often many various kinds, whose forms bespeak utter dissimilarity. (4.) Those of the sea, whose multitudes are too various to admit our knowledge.

It requires no inconsiderable strength of thought and reflection, no inconsiderable mental exertion, to form any idea of this multiplied class of beings: if we advert to those produced in waters around us, of which,

though some kinds seem to be nearly general, yet we find in almost every piece of water some peculiar to itself; if we estimate the number of such pieces of water, and the kinds appropriate to them in our own country, in Europe, on the globe; if we remark, that in warm climates Nature seems to sport in donation of life, that the tropics prompt and hasten generation after generation (therefore we must advance on the conception we may have formed of our own fertility), as well in kinds as in succession—when we have so done, we shall fall infinitely below the truth; no estimate we can possibly form will in any proportion approach the real fact. There exist creatures infinitely more abundant than we imagine, of kinds infinitely more diversified than we imagine, of dimensions infinitely smaller than we imagine, much as are vaunted the excursive powers of human imagination—what then shall we say to those whose habitation is the mighty deep; who are shrouded from our inspection amid the obscurity of the profound abyss? Their existence we cannot doubt, since we occasionally discover some of their fellows, and are not ignorant of others that inhabit the verges of the receptacle of waters.

What know we of the works of Almighty Power? Infinitely the majority is hid from us; very limited is our knowledge of what we seem to know; their grosser properties only, or merely their existences, are discerned by our natural senses, and little more by all the assistance of art and reason. Indeed our senses are extremely confined; but we glory that our rational powers have greatly augmented their abilities, have directed and assisted their researches, have demonstrated, that what seems utterly incredible may be fact, that what seems contrary to appearances may be just, that seemingly well grounded principles must often be admitted with hesitation, or be qualified by numerous exceptions, and that those who know most are but best instructed how much remains unknown.

We have surveyed animals whose bulk is enormous, whose strength is prodigious, whose voracity is tremendous: shall we contrast them to those whose smallness escapes our sight? How utterly dissimilar their dimensions, and their powers! At that we tremble, at this we smile; to assault one we conjoin hostile forces—number and union overcomes might; on the others we trample without regard, and crush myriad after myriad without reflection: those require vast spaces to afford maintenance; these are crowded into one mass: those reign tyrants of the deep or the forest; these seek shelter in the most minute crevices. Yet, if we compare such distant ranks, we find; that while the enormous cachalot supports itself by devouring thousands of its prey, so do these minute animacula, ever active, ever vigilant,

vigilant, to supply the cravings of appetite. The lion is not more terrific in the forest than these in the pool; nor better provided with arms for assault, or strength for conquest. What then shall we say to the still inferior creatures, their prey? If to some a grain of sand be a rock capable of holding thousands; if a hair be a tube capable of inclosing thousands—what are such as tremble at their aspect, shrink from their terrors, dread their approach, and fly from their devastations? Atoms of life! for what are you designed? what end do you answer in the rank of existence? Without you were the chain of being imperfect? would there be a void, a chasm, were you extinct? Could no power replace you but what at first created you? Must the same almighty skill, the same omniscient forecast, the same profound contrivance, appointment, and determination, be exercised toward you as toward the higher ranks of creatures? Where then is great or small? where high or low? where important or subordinate? Were you placed as mazes to perplex mankind, as labyrinths to embarrass human thought? Yet much as you and your fellows surpass our comprehension, we ourselves surpass it more; and when you, with all that surrounds you, the globe you inhabit, every tribe which now occupies it, which creeps or swims, or runs or flies, when every relation which unites you, every bond that binds you, when all, all shall terminate and be concluded, we shall be but beginning our incessant occupation of ascribing honour to Him, who was, and is, and is to come.

PRINCIPLES OF VEGETATION.

THE lower we descend on the scale of life the greater is our embarrassment, arising from numbers and varieties of species. If we found it necessary to content ourselves with general ideas, and a mere selection of fish and of insects, still greater difficulties prevent our intimate knowledge of vegetables; whose innumerable kinds, though long the study of naturalists, are daily proving that many remain hitherto unknown and unnoticed. Nor is this surprising, when we recollect the different situations, soils, and exposures which they prefer; the different levels at which they grow, on plains or on mountains, on hills or on alps. Abundant throughout the globe, and every spot producing some peculiar to itself, unless the whole globe were explored spot by spot (a hopeless suggestion!) how could all be known? Adapted to extremes of heat and cold, of humidity and dryness, adapted to every climate, to every region, their stores are inexhaustible: and however human industry may have penetrated with assiduous toil, not only among inhabited countries, but inhospitable wilds, yet, after all endeavours, many kinds will elude research, though perhaps native at no great distance, or perhaps their season lately past, or soon to come; if not actually present, but hidden in caverns or in clefts of the earth.

Declining therefore to enter deeply into a subject which in other hands has furnished many a bulky folio, and whose nomenclature alone, when arranged and abridged with the most persevering skill, forms solid volumes, we shall select those leading principles, which being common to all, may be brought to the test of daily experience: for that learning seems most advantageous, whose usefulness or application is perpetually recurring; that which is most simple, which is ever at hand, and ever delightful, is worthy our attention, and strongly claims our acquaintance. Without depreciating what may possess occasional usefulness or pleasure, what may delight or profit on emergency, we shall prefer what may be our constant companion and our attendant friend.

If pleasure be requested by mankind, we have already asserted, the purest pleasure is furnished by the tribes of vegetables, and human talents seem peculiarly adapted to their culture and enjoyment. If profit be requested, these are an unfailing source of profit; they sustain life, by furnishing food in various forms and of various qualities; they re-
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store health and counteract the progress of disease, if violent, by their activity and briskness; if latent, by gentle yet powerful operations: they regale the senses by their beauty and colours, by their odour and fragrance, by their relish and poignancy: they raise the mind to cheerfulness by their combination in the flowery parterre; they dispose it to solemnity by the deep umbrage of the majestic grove. Who feels not his spirits exhilarated when the bending corn waves in golden ridges, courting the sickle; when the luxuriant vine, wedded to its sturdy elm, hangs in purple festoons from bough to bough? The glories of harvest are the true glories of man; the joy of in-gathering his real joy; the scythe of the mower, not of war, is his trophy; and the blood of the grape, not of fellow men, his delight. O were men but sensible of real excellence and truly honourable distinction, they would seek it, not on the ensanguined, but the cultivated plain; not in spreading destruction, but in diffusing life through various ranks; they "would beat their swords into plough-shares, and their spears into pruning-hooks," to regulate the luxuriant earth which composes, supports, and awaits them.

When formerly considering vegetables according to their station on the scale of life, we thought ourselves justified in asserting, that "where there is growth there is life; that whatever subject increases or advances toward maturity, its progress is the consequence of a vital principle." Referring to that discourse for several suggestions which need not be repeated, we shall enlarge on the principal idea of the passage selected, by adverting to the generation, growth, structure, and nutrition of vegetables.

We possess some advantages for obtaining a general idea of the generation of vegetables, from having observed the various modes adapted to this purpose among animals; and if, in addition to this, we keep in view our principle, that life is most liberally bestowed as we descend, we may perhaps justly expect most of the animal modes of transmitting life should be found among vegetables, including the idea that some should be proper to themselves. We have seen animals prolong their species by the intercourse of sexes: this is a very prevailing manner; and in the instances of such as are oviparous, seems greatly coincident with the manners of many vegetables. To this effect we find parts appropriate in general, and these parts furnish a striking method (usually) of classing plants; though, from the smallness of some, and the intricate situations of others, they are not constantly obvious. Hence we have plants yielding on one tree flowers of both sexes, and in one flower parts of both sexes; of others, each plant is but one sex; and others have no flowers. That the

the intercourse of the former should be most frequent and certain seems natural; but the distances which often intervene between plants of the latter kind is considerable, and indeed furnishes no trifling objection to the supposition of their intercourse. As we have seen some animals self-impregnated, uniting in one individual the parts necessary to this effect, what should prevent the same in plants? Again, if what is related of the descent of impregnation in the instance of the gnat be true, why may not this principle also obtain among vegetables? So that if a plant be this year impregnated, it shall not need a repetition of this circumstance the next season (or next generation): and since there may be various other departures from what is, notwithstanding, a general rule; and since indeed among the most general rules Nature often surprises us with very extraordinary exceptions, I see no reason to deny either the affirmed sexual system of plants, or the force or fact of those instances which, in the opinion of many, militate against it.

Vegetables are capable no doubt of propagation by slips and cuttings, and I should suppose far beyond what is related of any animal whatever; wonderful as are the facts admitted of the polypus: but whether there be any vegetable capable of propagation only by this method is not that I know of affirmed; or whether there be any vegetable entirely precluded from this method: for not only plants may, by trailing, be made to shoot from the knots, &c. in their stems, but branches of trees, if judiciously managed, will become complete trees, not inferior in magnitude to their parents; nor are less remarkable the subdivisions of vitality in the fruit of a potato, every *eye* of which is capable of producing a perfect plant. There is however one remarkable singularity attending vegetables, in that, as the branches are capable of thus becoming roots, so the roots are capable of becoming branches. Should we incline to change the situation of these parts of a tree, the undertaking is feasible, and has actually been accomplished in smaller subjects, by surrounding the branches with earth in a garden-pot; and, when they have drawn nutriment from the earth, gradually withdrawing the root from its bed, and accustoming it to depend for supply on its former branches; then judiciously choosing the time for its exposure to the air, and its production of leaves.

Grafting is a kind of planting a branch from one tree in the body of another; to this it unites, and with this it lives and prospers, or withers and decays: but it does not here unite by shooting out roots as it would were it in the earth, for its nutritive juices are not to seek; the tree supplies them, partly digested too, and fit for immediate use. This is clearly
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the case where trees of a similar nature are united, and in those where curiosity has combined dissimilar natures, it has been partly the case; the nutriment has been in a degree forwarded toward fitness, and the graft has completed its deficiency. That juices thus twice *strained*, as it were, first by the roots of the tree, then by the pores of the graft, should gain or lose somewhat alterative to the flavour of the fruit yielded by the graft, is not wonderful; that it should be enriched or mellowed, should be acidulated or softened, seems natural, and to depend on the qualities of the tree from which it now derives its nourishment.

But as the general propagation of vegetables is rather by seeds than by any other mode, to them we shall now turn our attention.

SEEDS of plants are of various figures and sizes. Most are divided into two lobes; though some, as those of the cress-kind, have six; and others, as the grains of corn, are entire.

But as the essential properties of all seeds are the same, when considered with regard to the principles of vegetation, our description shall be limited to one, the great garden-bean; because, after it begins to vegetate, its parts are more conspicuous than many others, and consequently better calculated for investigation.

This seed is covered with two coats or membranes; the outer extremely thin and full of pores, but may be easily separated from the inner one (which is much thicker), after the bean has been boiled, or lain a few days in the soil. At the thick end of the bean is a small hole visible to the naked eye, immediately over the radicle or future root, that it may have a free passage into the soil. When these coats are taken off, the body of the seed appears, which is divided into two smooth portions or lobes. The smoothness of the lobes is owing to a thin film or cuticle with which they are covered.

At the basis of the bean is placed the radicle or future root, whose trunk, just as it enters into the body of the seed, divides into two capital branches, one to each lobe, and sends off smaller ones in all directions through the whole substance of the lobes: these become so extremely minute toward the edges of the lobes, that they require the finest glasses to render them visible. To this Grew and Malpighius have given the name of *feminal root*; because, by means of it, the radicle and plume, before they are expanded, derive their principal nourishment.

The plume, bud, or germ, is enclosed in two small corresponding cavities in each lobe. Its colour and consistence is much the same with those of the radicle, of which it is only a continuation; but having a quite

contrary direction : for the radicle descends into the earth, and divides into a great number of smaller branches or filaments ; but the plume ascends into the open air, and unfolds itself into stem, branches, leaves, flowers, fruit, &c. The plume in corn shoots from the smaller end of the grain.

The substance, or parenchymatous part of the lobes is not a mere concentered juice, but is curiously organized, and consists of a vast number of small bladders resembling those in the pith of trees.

When the seed is sown, the moisture is first absorbed by the outer coats, which are every where furnished with sap and air-vessels ; from these it is conveyed to the cuticle ; from the cuticle it proceeds to the pulpy part of the lobes, where it is taken up by the mouths of the small branches of the seminal root, and passes from one branch to another into the main trunk, which communicates both with the plume and radicle : then this vegetable food runs in two opposite directions ; part ascending into the plume, promotes its growth and expansion ; part descending into the radicle, nourishes the root and its filaments. Thus a plant is really possessed of two roots, both contained in the seed. The plume and radicle, when the seed is first deposited in the earth, derive their nourishment from the seminal root ; afterwards, when the radicle begins to shoot out its filaments, and to absorb some moisture, not, however, in a sufficient quantity to supply the exigencies of the plume, the two lobes, or main body of the seed, rise with the plume, assume the appearance of two leaves, resembling the lobes of the seed in size and shape, but having no resemblance to those of the plume, for which reason they have got the name of *dissimilar leaves*.

These dissimilar leaves defend the young plume from the injuries of the weather ; and at the same time, by absorbing dew, air, &c. assist the tender radicle in nourishing the plume, with which they have still a connection by means of the seminal root. But, when the radicle or second root has descended deep enough into the earth, and has acquired a sufficient number of filaments or branches for absorbing as much aliment as is proper for the growth of the plume, then the seminal or dissimilar leaves, their utility being entirely superseded, begin to decay and fall off.

Thus we see, that as the egg contained not merely the foetus of an animal, but a portion of nourishment suitable to its powers, whereby it was sustained, and capable of supporting life a considerable time ; so the seed contains a portion of matter fitted to nourish the nascent root, capable of becoming part of it, and of supporting it till its own powers were competent to

that purpose. From this period the plant is to expect a supply from the root, and to derive nourishment by means of its extensive ramifications, and their absorbent properties.

We proceed now to notice the structure of plants: and first of the root:

In examining the Root of plants, the first thing that presents itself is the skin, which is of various colours in different plants. Every root, after it has arrived at a certain age, has a double skin. The first is coeval with the other parts, and exists in the seed; afterwards a ring sent off from the bark forms a second skin; *e. g.* in the root of the dandelion, towards the latter end of May, the original or outer skin appears shrivelled, and is easily separated from the new one, which is fresher, and adheres more firmly to the bark. Perennial plants are supplied with a new skin every year; the outer one falls off in the autumn or winter, and a new one is formed from the bark in the succeeding spring. The skin has numerous cells or vessels, and is a continuation of the parenchymatous part of the radicle. However, it does not consist solely of parenchyma, for the microscope shews that there are many tubular ligneous vessels interspersed through it.

When the skin is removed, the true cortical substance or bark appears, which is also a continuation of the parenchymatous part of the radicle, but greatly augmented. The bark is of very different sizes. In most trees it is exceedingly thin in proportion to the wood and pith. On the other hand, in carrots, it is almost one half of the semidiameter of the root; and in dandelion it is nearly twice as thick as the woody part.

The BARK is composed of two substances, the parenchyma, or pulp, which is the principal part, and a few woody fibres. The parenchyma is exceedingly porous, and has great resemblance to a sponge; for it shrivels considerably when dried; and dilates to its former dimensions when infused in water. These pores or vessels are not pervious so as to communicate with each other, but consist of distinct little cells or bladders, scarcely visible without the assistance of the microscope. In all roots, these cells are constantly filled with a thin watery liquor. They are generally of a spherical figure, though in some roots, as the bugloss and dandelion, they are oblong. In many roots, as the horse-radish, peony, asparagus, potato, &c. the parenchyma is of one uniform structure; but in others it is more diversified, and puts on the shape of rays running from the centre towards the circumference of the bark. These rays sometimes run quite through the bark, as in lovage; and sometimes advance toward the middle of it, as in melilot and most of the leguminous

and umbelliferous plants. These rays generally stand at an equal distance from each other in the same plant; but the distance varies greatly in different plants. Neither are they of equal sizes: in carrot they are exceedingly small and scarcely discernible; in melilot and chervil they are thicker. They are likewise more numerous in some plants than in others. Sometimes they are of the same thickness from one edge of the bark to the other; and some grow wider as they approach toward the skin. The vessels with which these rays are amply furnished are supposed to be air-vessels, because they are always found to be dry, and not so transparent as the vessels which evidently contain the sap.

In all roots there are ligneous vessels dispersed in different proportions through the parenchyma of the bark. These run longitudinally through the bark in the form of small threads, tubular, as is evident from the rising of the sap in them when a root is cut transversely. These ligneous sap-vessels do not run in direct lines through the bark, but, at small distances, incline towards one another in such a manner, that they appear to the naked eye to be inosculated; but the microscope discovers them to be only contiguous, and braced together by the parenchyma. These braces are very various both in size and number in different roots; but in all plants they are most numerous toward the inner edge of the bark. Neither are these vessels single tubes, but, like the nerves in animals, are bundles of twenty or thirty small contiguous cylindrical tubes, which uniformly run from the extremity of the root, without sending off any branches, or suffering any change in their size or shape.

In some roots, as parsnips, especially in the ring next the inner extremity of the bark, these vessels contain a kind of lymph, which is sweeter than the sap contained in the bladders of the parenchyma. From this circumstance they have got the name of *lymph-ducts*.

These lymph-ducts sometimes yield a mucilaginous lymph, as in the comphrey; and sometimes a white milky glutinous lymph, as in the angelica, sonchus, burdock, scorzonera, dandelion, &c. The lymph-ducts are supposed to be the vessels from which the gums and balsams are secreted. The lymph of fennel, when exposed to the air, turns into a clear transparent balsam; and that of the scorzonera, dandelion, &c. condenses into a gum.

The situation of the vessels is various. In some plants they stand in a ring or circle at the inner edge of the bark, as in asparagus; in others they appear in lines or rays, as in borage; in the parsnip, and several
other

other plants, they are most conspicuous toward the outer edge of the bark; and in the dandelion they are disposed in the form of concentric circles.

The **WOOD** of roots is that part which appears after the bark is taken off, and is firmer and less porous than the bark or pith. It consists of two distinct substances; (1) the pulpy, or parenchymatous; (2) the ligneous. The wood is connected to the bark by large portions of the bark inserted into it, mostly in the form of rays, tending to the centre of the pith, easily discernible by the eye in a transverse section of most roots. These insertions, like the bark, consist of many vessels, mostly round or oval.

The ligneous vessels are generally disposed in collateral rows running longitudinally through the root. Some of these contain air, others sap. The air-vessels are distinguished by being whiter.

The **PITH** is the central part of the root. Some roots have no pith, as the stramonium, nicotiana, &c.; others have little or none at the extremities of the roots, but a considerable quantity near the top. The pith, like every other part of a plant, is derived from the seed: but in some it is more immediately derived from the bark; for the insertions of the bark running in betwixt the rays of the wood, meet in the centre, and constitute the pith. It is owing to this circumstance, that among roots which have no pith in their lower parts, they are amply provided with it towards the top, as in columbine, lovage, &c.

The bladders of the pith are of very different sizes, and generally of a circular figure. Their position is more uniform than in the bark. Their sides are not mere films, but a composition of small fibres or threads, which gives the pith, when viewed with a microscope, the appearance of a piece of fine gauze or net-work.

We shall conclude the description of roots with observing, that their whole substance is nothing but a congeries of tubes and fibres, adapted by nature for the absorption of nourishment, and of course the extension and augmentation of their parts.

In describing the **TRUNKS** of plants, it is necessary to premise, that whatever is said with regard to them applies equally to the branches.

The trunk, like the root, consists of three parts; the bark, wood, and pith. These, though substantially the same in the trunk as in the root, are often very different in texture and appearance.

1. The skin of the bark is composed of very minute bladders, interspersed with longitudinal woody fibres, as in the nettle, thistle, and most herbs.

herbs. The outside of the skin is visibly porous in some plants, particularly the cane.

The principal body of the bark is composed of pulp or parenchyma, and innumerable vessels much larger than those of the skin. The texture of the pulpy part, though the same substance with the parenchyma in roots, seldom appears in the form of rays running towards the pith; and when these rays do appear, they do not extend above half way to the circumference. The vessels of the bark are very differently situated, and destined for various purposes in different plants. For example, in the bark of the pine, the inmost are lymph-ducts and exceedingly small; the outmost are gum or resiniferous vessels, destined for the secretion of turpentine; and are so large as to be distinctly visible to the naked eye.

2. The **WOOD** lies betwixt the bark and pith, and consists of two parts; (1) parenchymatous, (2) ligneous. In all trees, the parenchymatous part of the wood, though much diversified as to size and consistence, is uniformly disposed in diametrical rays, or insertions running betwixt similar rays of the ligneous part.

The true wood is nothing but a congeries of old dried lymph-ducts. Between the bark and the wood a new ring of these is formed every year, which gradually loses its softness as the cold season approaches, and, towards the middle of winter, is condensed into a solid ring of wood. These annual rings, which are distinctly visible in most trees when cut through, serve as natural marks to distinguish their age. The rings of one year are sometimes larger, sometimes less, than those of another, probably owing to the favourableness or unfavourableness of the season.

3. The **PITH**, though of a different texture, is exactly of the same substance with the parenchyma of the bark, and the insertions of the wood. The quantity of pith is various in different plants. Instead of being increased every year like the wood, it is annually diminished, its vessels drying up and assuming the appearance and structure of wood; insomuch that in old trees there is scarce such a thing as pith to be discerned.

A ring of sap-vessels are usually placed at the outer edge of the pith, next the wood. In the pine, fig, and walnut, they are very large. The parenchyma of the pith is composed of small cells or bladders, of the same kind with those of the bark, only of a larger size. The general figure of these bladders is circular; though in some plants, as the thistle, and borage, they are angular. Though the pith is originally one connected chain of bladders; yet, as the plant grows old, they shrivel, and
open.

open in different directions. In the walnut, after a certain age, it appears in the form of a regular transverse hollow division. In some plants it is altogether wanting; while in others, as the sonchus, nettle, &c. there is only a transverse partition of it at every joint. Many other varieties might be mentioned.

The leaves of plants consist of the same substance with the trunk. They are full of nerves or woody portions, running in all directions, and branching out into innumerable small threads (interwoven with the parenchyma) like fine lace or gauze.

The skin of the leaf, like that of an animal, is full of pores, which both serve for perspiration, and for the absorption of dews, air, &c. These pores, or orifices, differ both in shape and magnitude in different plants, which is the cause of that variety of texture or grain peculiar to every plant.

The pulpy or parenchymatous part consists of very minute fibres, wound up into small cells or bladders. These cells are of various sizes in the same leaf.

All leaves, of whatever figure, have a marginal fibre, by which all the rest are bounded. The particular shape of this fibre determines the figure of the leaf.

The vessels of leaves have the appearance of inosculating; but, when examined by the microscope, they are found only to be interwoven, or laid along each other.

What is called air-vessels, or those which carry no sap, are visible even to the naked eye in some leaves. When a leaf is slowly broke, they appear like small woolly fibres, connected to both ends of the broken piece.

The texture, vessels, &c. of flowers are pretty similar to those of the leaf.

Every flower is perfectly formed many months before it appears outwardly; that is, the flowers which appear this year are not, properly speaking, flowers of this year, but of the last. For example, mezereon generally flowers in January; but these flowers were completely formed in the month of August preceding. By separating the coats of a tulip-root about the beginning of September, we find that the two innermost form a kind of cell, in the centre of which stands the young flower, which is not to make its appearance till the following April or May.

In describing the structure of fruits, a few examples shall be taken from such as are most generally known.

A PEAR, besides the skin, which is a production of the skin of the bark, consists of a double parenchyma or pulp, sap, and air-vessels, calculary and acetary.

The outer parenchyma is the same substance continued from the bark, only its bladders are larger and more succulent.

It is every where interspersed with small globules or grains, and the badders respect these grains as a kind of centres, every grain being the centre of a number of bladders. The sap and air-vessels in this pulp are extremely small.

Next the core is the inner pulp or parenchyma, which consists of bladders of the same kind with the outer, only larger and more oblong, corresponding to those of the pulp, from which it seems to be derived. This inner pulp is much sourer than the other, and has none of the small grains interspersed through it, and hence it has got the name of *acetary*.

Between the acetary and outer pulp the globules or grains begin to grow larger, and gradually unite into a hard stony body, especially towards the corculum, or stool of the fruit; and from this circumstance it has been called the *calculary*.

These grains are not derived from any of the organical parts of the tree, but seem rather to be a kind of concretions precipitated from the sap, similar to the precipitations from wine, urine, and other liquors.

The core is a roundish cavity in the centre of the pear, lined with a hard woody membrane, in which the seed is inclosed. At the bottom of the core there is a small duct or canal, which runs up to the top of the pear; this canal allows the air to get into the core for the purpose of drying and ripening the seeds.

In a LEMON, the parenchyma appears in three different forms. The parenchyma of the rind is of a coarse texture, composed of thick fibres, woven into large bladders. Those nearest the surface contain the essential oil of the fruit, which bursts into a flame when the skin is squeezed over a candle. From this outmost parenchyma nine or ten insertions or lamellæ are produced, which run between as many portions of the pulp, and unite into one body in the centre of the fruit, which corresponds to the pith in trunk or roots. At the bottom and top of the lemon, this pith evidently joins with the rind, without the intervention of any lamellæ. This circumstance shews that the pith and bark are actually connected in the trunk and roots of plants, though it is difficult to demonstrate the connection, on account of the closeness of their texture, and the minuteness of their fibres. Many vessels are dispersed through

the

the whole of this parenchyma; but the largest ones stand on the inner edge of the rind, and the outer edge of the pith, just at the two extremities of each lamellæ.

The second kind of parenchyma is placed between the rind and the pith, is divided into distinct bodies by the lamellæ; and each of these bodies forms a large bag.

These bags contain a third parenchyma, which is a cluster of smaller bags, distinct and unconnected with each other, having a small stalk by which they are fixed to the large bag. Within each of these small bags are many hundreds of bladders, composed of extremely minute fibres. These bladders contain the acid juice of the lemon.

The vessels in the roots of plants absorb moisture from the earth, and convey it to the trunk, branches, leaves, &c. This moisture, when it first enters the root, is crude; but as it ascends into the other parts of the plant, it undergoes several changes, by means of the different configurations of the vessels peculiar to each part. Thus the leaves, flowers, fruit, and seed, have all something peculiar in the structure and arrangement of their vessels, which produces considerable changes in the nature of the sap. It is not known how these changes are produced: but how the stomachs of animals make chyle from animal and vegetable substances, or how urine, saliva, bile, &c. is secreted from the common mass of blood, is as little known. The sap likewise moves in a lateral or horizontal direction.

Philosophers were greatly divided about the circulation of the sap. Some contended that it returns to the root betwixt the bark and wood. But Hales, who has made many accurate experiments on the subject, has shown, that it does not circulate, but ascends and descends in the same vessels; that it ascends in hot weather, and descends in cold, like the spirits in a thermometer.

Vegetables begin to absorb sap about the beginning of spring, and soon after shoot out their buds, leaves, and flowers.

When plants are in a state of vegetation, especially in hot weather, there is a great deal of superfluous sap absorbed; but the superfluity is carried off by transpiration. Every part of a plant transpires, but the greatest quantity passes by the leaves.

Some have assigned the transpiration of plants as the cause of the motion of the sap. It is undoubtedly one cause of this motion; because, if the transpiration be stopped, at a time when all the vessels are full, the motion of the sap must stop of course. But then there is a previous and

principal cause, viz. that power in the vessels, whatever it is, that first puts the sap in motion before transpiration has commenced.

Heat, moisture, and air, are the three chief circumstances that promote the ascent of the sap. Hence nothing is more favourable to vegetation than warm weather, accompanied with rain: on the other hand, cold dry weather is its greatest enemy. In a wet cold season every thing rots; and in hot dry weather every thing is parched. But the circumstances most favourable to vegetation are cloudy hot weather, inclinable to thunder, succeeded by plentiful rains.

It would appear very improbable, that the same matter could nourish such a variety of plants, differing so essentially in smell, taste, figure, &c. Much, however, may depend on the internal structure and arrangement of the vessels. If the vessels in any plant be uncommonly small, parts will be rejected by that plant which would be absorbed by one whose vessels are larger. Nay, changes may be made in the crude homogeneous nourishment, by a small difference in the figure or action of the vessels.

One plant will starve another by robbing it of its nourishment, either by extending its roots, and requiring a greater quantity of nourishment, or by absorbing the peculiar food which is necessary for the growth of the other plant.

That a poisonous plant and its antidote will grow in the same soil, may be owing either to these plants imbibing different juices from the earth, or to peculiarities in the structure and action of their vessels.

A stalk of a lemon, grafted on a branch of an orange-tree, grew, ripened its fruit, and preserved the figure and all the other qualities belonging to a lemon. This plainly indicates, that the organization of the lemon had given a different modification to the juices of the orange, through the intervention of which it received its nourishment.

It is also certain, that the different parts of the same plant have frequently various smells, tastes, &c. although the nourishment derived from the root must be the same. This is an evidence, that the different structure of parts in the same plants is capable of producing very sensible changes in the nature and quality of the sap.

Repeated experiments show, that many plants of very opposite qualities, and even trees, have been nourished and brought to maturity by water alone.

The roots of plants are fitted to absorb every fluid that comes within their reach. They have been found by experiment to imbibe fluids

fluids that actually poison them. From this circumstance it may be fairly concluded, that they have not, like animals, the sagacity of choosing the food that is most proper for nourishing them, and rejecting that which is either noxious or less nourishing.

That the earth may supply a variety of juices is undeniable; that a plant may have pores too narrow to admit some is also undeniable: but it seems to me that somewhat also is to be attributed to that kind of juice to which the plant has been accustomed; for we know that if a number of worsted threads be hung in a basin of oil, so that they absorb the oil, and it run through them, they will not in like manner imbibe water; the oil they contain forbids it; if they are squeezed never so dry, so that apparently the oil were gone from them, yet what little remains will unfit those threads for the absorption of water: the same occurs if they had been imbued with water, they will refuse to transmit oil. May it not then be, that one effect of the pulpy part of the seed has been to accustom the fibres of the seminal root to such a juice as suits its nature? or have not those fibres drawn from (perhaps through) that pulp a juice tinged or contaminated with its own properties, and thereby partly concocted for the aliment of the plant? to which being habituated and thoroughly drenched in it, it ever after admits passage to those only which are of a similar nature. Thus a poisonous seed accustoms its offspring-fibres to a poisonous juice, and perpetuates their properties. In an earth which does not furnish such a juice; the plant will not thrive, if it will live; which perhaps it may, by assimilating such innocent juices as it procures, so far as it can, to its own nature, which yet may not be far enough to perfect its properties: whence that may be deadly in one soil which in another is only noxious, or that noxious in one which in another is only insipid; and with this seems to agree the analogy of most vegetable poisons, which often by transplantation lose their most lively properties; and the variation of plants, corn, &c. which in one soil flourish, perhaps improve, in another degenerate; this cause then traces their properties to their origin, and shews the nature impressed upon them; which probably is preserved by a greater or less number of each plant respectively always occupying a portion of earth where it meets with juices adapted to its maintenance in full vigour. It is natural to suppose that after having passed through so great a number of canals and passages between the root and the branches (and perhaps acquiring a tinge from many in its progress), it should be highly impregnated ere it arrive at the fruit; where, and especially in the seeds of that fruit, it should undergo the

last stage of exaltation, and be ripened into qualities perfectly corresponding to those of the tree.

That plants partake of the nature of the soil whereon they grow is notorious; and this in no trifling degree: plants which in a free soil have no nitre in them, yet yield nitre when they grow on a nitrous soil, as is often experienced in the nitre-works in France.

Though I have said plants *may* live by assimilating such juices as they *can* procure, yet I apprehend if there be an absolute dearth of such as are proper to them, though there be plenty of others in the spot where they grow, they will pine, languish, and die. Hence water plants cannot support a dry soil, and heath plants are rotted by humidity. Nevertheless it is asserted, that as the desert plains of Africa, where a parched and sandy soil prohibits vegetation, yield only mosses and lichens, so the highest Alpine regions, and the most rigorous northern climates, yield only mosses and lichens also. Strange, that the same plants should support extremes of heat and cold, yet refuse to flourish in temperate climates and richer soils!

I have heretofore considered irritability as an indefinitely lower degree of sensibility; for I confess I am unable to draw any line whereat to distinguish these principles. The irritability of plants is a curious subject: but not yet entirely elucidated. It is not always alike, but capable of increase and decrease; is said to be greatest in the morning, less at noon, still less in the evening; greatest in spring, less in summer, still less in autumn: whether it be recruited by winter torpidity, therefore most abundant in spring, or by nightly repose, therefore most abundant in the morning; or whether it may not depend on the different states of the atmosphere, which in spring and morning is humid and cool, is submitted. That humidity is grateful to plants is clear; that coolness constricts their fibres, as heat renders them flaccid, loose, and therefore probably inert, by reason of a smaller degree of tension, is also clear. Whether this latter cause may not influence those plants which apparently follow the sun has been doubted: for if those parts of the stem whereon his rays fall most immediately are thereby rendered weaker than those not exposed to his rays, doubtless they will give way, and the flower will bend to that side: if this be granted, then, that coolness should constrict the fibres of plants, that constriction should act principally on those parts which had been expanded, *i. e.* the flowers, is natural. That coolness obtains before rain, and in the evening, is certain; and on this principle, the closure of certain plants and flowers is thus accounted for: but as

some

some are opening and closing at all times (inasmuch that Linnæus, by observing their state, informs us we may know the hour of the day, and hence calls them *Flora's Watch*), and as others open only during night, this cause seems inadequate to so great variety of effects. What is termed the sleep of plants, is supposed to proceed from exhaustion of irritability, and is most observable in young plants, and in spring.

The *Mimosa*, or *Sensitive Plant* (of which Linnæus reckons forty-six species) is the great instance of irritability; as, beside contracting its leaves in the evening, it may be made to contract them at any time, by the touch of the hand, the fumes of volatile alkali, the electric spark, musk, or opium: and this contraction is so powerful, that, on its taking place, the leaves may be easier broken than re-expanded; but the plant will regain its natural state after an interval of from ten minutes to half an hour. Immersion in water does not produce these effects. Their general progress is according to the force or quantum of stimulus engaged on the plant, affecting first one leaf, then its fellow or pair on the stalk, then the pedicle or foot-stalk, moving upwards, then all the leaves on that branch, then the branch to the very stem of the plant. A shaking motion affects the whole plant; but it is possible to affect the branches and not the leaves.

That plants are greatly affected by the impulse of light, appears not only from what we have said when treating of light, but from the instance of this very plant. A sensitive plant, placed in a dark cave, was twenty-four hours before it expanded, and then very partially; suffered no change at night or morning; but being placed in the open air, recovered its natural state and irritability. Another, kept in a dark room during some hours after day-break, did not expand; but, restored to the light, expanded without delay.

According to the structure of plants they shew their irritability in various manners: the *Dionea Muscipula*, or Venus's fly-trap, is so called, because, if an insect enter its flower, designing to taste its sweets, the leaves close upon him, and hold him beyond his powers to extricate himself.

Parasitical plants, which grow on other trees, as the mistletoe, or which climb on other trees, as the ivy, and numberless others, are a curious class of plants; many of which never drew nourishment from mother earth, but from their supporting tree, which they often strangle and destroy. In hot countries these are often so noxiously abundant, no art can exterminate them.

Vegetables are greatly exposed to the depredations of insects : almost every plant has numbers attached to itself, and many suffer by several in succession ; being while just sprouting the favourite food of some, when further advanced of others, and when mature of others. To this cause has been attributed the blight of corn.

Vegetables, when decayed, compose that kind of earth or mould, which of all earths is best adapted to nourish vegetable life, and indeed without which no fertility can be expected. Hence, if in a sandy soil that plant which can support such a soil be cultivated, and left to rot, then another crop of the same succeed, and be ploughed in, by degrees the sandy soil will become mixed with vegetable earth, and after a while will be capable of nourishing whatever plants are committed to its bosom.

Vegetation is no less strong in the water than on land ; in the ocean than on the plains : nor is it confined to plants, but produces large trees of solid wood. Of these we must expect to continue ignorant, except as accident discloses them. Can those which grow in perpetual darkness be stimulated by light ? Have those variations of irritability which dwell in a medium invariably cold and dense, often perhaps stagnant and motionless ?

Thus we have endeavoured to illustrate the generation, growth, structure, and nutrition of vegetables : their numbers forbid extending our disquisitions, and their properties are various as their numbers ; however, we shall just observe, that some are *poisonous*, and in certain instances so strongly as to poison the air around them. We have an extraordinary relation of a great tree of this nature in Japan, to which only condemned criminals are sent to gather its gum : they approach the tree to windward, yet few return to claim exemption from further punishment. Another and a well authenticated instance is the manchineel tree, under whose branches should an unwary traveller take refuge, the drops of rain falling from them would at least corrode and blister his skin, if he escaped so. Our own yew has similar, though very greatly inferior, reputation among some. Nor should opium be forgotten, which is yielded by the white poppy, cultivated for that purpose in the East : in small quantities this promotes sleep ; in large quantities fatal sleep. By habit the Eastern people can eat it in lumps, and drinking a glass of cold water after it, experience merely intoxication ; yet gradually it shortens their days, produces decrepitude, and undermines the natural powers. The number of plants having poisonous qualities is considerable ; and

much discretion, or rather knowledge, is requisite to distinguish some of them from salutary herbs. Many of them are berry-bearing, and their berries delude the eyes of children not without risque.

Mankind, exposed to inclement seasons, will ever be beholden to vegetables for shelter : hence our obligations to timber trees of all sorts, from the stately oak of which ships are constructed, to the slender osier which yields only wattles : this is too obvious to require enlargement ; and even supposing they furnish no edible fruit for our support, or that of animals for our use. But by fruit-bearing trees we are doubly accommodated, not only with shelter but with food, not only with wood but with provision : hence the apple, pear, plum, peach, cherry, and many others, are highly valuable ; they furnish our tables with a dessert, and delight our palates with their vivacity and relish. The vine, indeed, boasts no wood for beams, or for furniture, but its fruit is noble, and, temperately used, invaluable. All nations have had recourse for cheering drinks to infusions, or to the sap, of vegetables. I shall not enlarge on the variety of fruits ; on their successions, each in its season ; on their qualities of preservation, and indeed improvement by keeping ; nor on their profit, in that what is not fit for our use has many animals awaiting its donation, to whom it is grateful though imperfect.

Grain is a part of our provision, on which we depend with the utmost assurance ; whose absence nothing can supply ; whose loss nothing can compensate. Happy for us not only that it is fertile and productive, but that, after many years keeping, its nutritive qualities are not impaired.

Garden vegetables preserve us in health : they unite delicacy of taste to salubrity ; they offer us choice either of roots or plants, either of pulse or herbs ; some for present use, others for stores. If we quit the kitchen garden for the parterre, we are enlivened at the sight of blooming flowers, and regaled by their odours : sometimes they yield us ornament, sometimes perfume, sometimes a remedy, always a moral. Some we submit to the still, of some we extract the essences, of some we preserve the forms, and others, which we cannot preserve, we imitate. Such delight have we ever taken in flowers !

For personal accommodation we praise the flax, whose beaten fibres yield elegance and health : nor let us forget the hemp, whose hardy stalks furnish our ships with wings. The most immense sail is but an union of hempen threads ; the strongest cable is but a combination of twists, weak asunder, but their united strength resists the rolling waves ;

ensuring security to the adventurous mariner, amid the swellings of the mighty deep.

It is evident, that to understand, though but remotely, the relations of these so different subjects, discrimination is both desirable and necessary: since they are not alike, we may justly separate the different, and combine the similar; to accomplish which purpose is the design of botanical systems.

Smell and taste give us some intimation of the nature and qualities of plants. An agreeable taste or smell is seldom accompanied with noxious qualities; on the other hand, when these senses are disagreeably affected, the qualities are generally more or less noxious, being either purgative, emetic, or poisonous. Plants that have a sweet taste are generally nutritive; those that have a salt taste are warm and stimulant. Plants of an acrid taste are corrosive; but, when deprived of their acrimony by drying, some of them become fit for food. Bitter plants are alkaline, stomachic, and sometimes of a suspicious nature. Acid plants are cooling, and allay thirst; but those of an austere taste are astringent.

The colour and aspect of plants throw some light upon their nature. Flowers or fruit of a red colour are generally acid. Yellow flowers indicate a bitter taste. Plants that have green flowers are crude; those of a pale colour are commonly insipid; those of a white colour are generally sweet; and those whose flowers have a gloomy and dismal aspect, are mostly poisonous.

In order to bring the numerous tribes of vegetables under certain classes or denominations, various methods have been adopted by different authors. Some have classed them by the figure of their roots; some by the caulis or stems; some by the leaves. Linnæus has preferred the parts of fructification, because these are not only the most essential, but likewise the most universal.

This method of classing is preferable to any that has been proposed, on many accounts. It is found by experience, that plants which are distinguished by the same characters in the flower and fruit, have the same qualities, though not always in an equal degree as to strength or weakness; so that, upon inspection of the flower and fruit, a botanist can determine *à priori* the effects that will result from the plant when taken into the stomach.

This method of reducing plants to classes, genera, and species, is founded upon the supposition that vegetables propagate their species in a manner similar to that of animals. Linnæus endeavours to support this hypothesis

hypothesis by the many analogies that subsist between plants and animals. From this circumstance Linnæus's system of botany has got the name of the *sexual system*. The names of his classes, orders, &c. are all derived from this theory. He calls the stamina of flowers the *males*; the pistils *females*. Plants whose flowers contain both male and female parts, are said to be *hermaphrodites*, &c. His classes, orders, and genera, are all derived from the number, situation, proportion, and other circumstances attending those parts.

Twenty-four classes comprehend every known genus and species. It is an easy matter to class a plant belonging to any of the first eleven classes, as they all depend on the number of stamina or male parts, without regard to any other circumstance. The 12th class requires more attention. When the stamina amount to above 20, particular regard must be had to the insertion of the stamina. If they are inserted into the calix or cup, the plant belongs to the icosandria class; if to the receptacle or basis of the flower, it belongs to the polyandria.

The 14th class is likewise in danger of being confounded with the 4th. In the 4th, the number of stamina is the same with that of the 14th. But, in the 14th, two of the stamina are uniformly much shorter than the other two; at the same time each particular stamen belonging to the different pairs stands directly opposite to one another.

The 15th class may be mistaken for the 6th, as they consist of the same number of stamina. But in the 15th, four of the stamina are uniformly longer than the other two; and these two are always opposite to each other.

SCHEME of the SEXUAL SYSTEM.

{ Either publicly, *i. e.* have visible flowers.

{ *Monoclinia*, males and females together :—*i. e.* The flowers all hermaphrodite, having stamina and pistils in the same flower.

{ *Diffinitas*, the males or stamina unconnected with each other.

{ *Indifferentissimus*, the males or stamina having no determinate relative proportion as to length.

{ *i. e.* one male or stamen in a hermaphrodite flower:

1. MONANDRIA, — two males or stamina.

2. DIANDRIA, — three males.

3. TRIANDRIA, — four males.

4. TETRANDRIA, — five males.

5. PENTANDRIA, — six males.

6. HEXANDRIA, — seven males.

7. HEPTANDRIA, — eight males.

8. OCTANDRIA, — nine males.

9. ENNEANDRIA, — ten males.

10. DECAANDRIA, — eleven males.

11. DODECAANDRIA, — twenty, or more males inserted into the calix, and not into the receptacle.

12. ICOSANDRIA, — all above twenty males inserted into the receptacle.

13: POLYANDRIA, — four males, two of them uniformly shorter than the rest.

{ *Subordinatio*, two of the males or stamina uniformly shorter than the rest.

14. DIDYNAMIA, — six males, two of which are uniformly shorter than the other two.

15. TETRADYNAMIA, — the males or stamina either connected to each other, or to the pistillum.

16. MONDELPHIA, the males or stamina united into one body by the filaments.

17. DIADELPHIA, the stamina united into two bodies or bundles by the filaments.

18. POLYADELPHIA, the stamina united into three or more bundles by the filaments.

19. SYNGENESIA, the stamina united in a cylindrical form by the antheræ.

20. GYNANDRIA, the stamina inserted into the pistillum.

{ *Diclinia*, males and females in separate beds ; *i. e.* plants that have male and female flowers in the same species.

21. MONOECIA, male and female flowers in the same plant.

22. DIOECIA, male flowers in one plant, and females in another, of the same species.

23. POLYGAMIA, male, female, and hermaphrodite flowers in the same species.

{ Or clandestinely, *i. e.* whose parts of fructification are invisible.

24. CRYPTOGAMIA, the flowers invisible, so that they cannot be ranked according to the parts of fructification.

GARDEN BEAN

VEGETATION

WORMWOOD ROOT
Magnified

Natural Size

OBSERVATIONS

ON THE

PLATES belonging to the DISCOURSE.

GARDEN BEAN.

NUMBER I. Shews the state of this seed previous to its being committed to the earth: the future plant is very apparent, and surrounded by the pulpy matter that is afterwards to afford it nutriment. That a similar plant occurs in other seeds, is evident to whoever will open plums, cherries, &c. carefully.

No. 2. The seed having been a few days in the earth, the germ is beginning to shoot upward, and draws nourishment from a system of minute vessels, distributed throughout the pulpy part of the seed.

No. 3. The root shooting strongly downward in search of nourishment, which it may contribute in addition to that furnished by the minute ramifications dispersed throughout the pulp.

No. 4. Is the state of the bud of a gourd when it has been some time in the earth, shewing the root striking into the ground.

No. 5. Shews the little plant issuing from between the two feminal leaves (A B); the feminal leaf A being bent downward: the root is cut off.

No. 6. Shews the root making further advances into the earth, and shooting deeper, while the feminal leaves are rising into the air.

No. 7. The kernel of an orange in a progressive state. C, the feminal leaf having done its duty, now about to become rotten.

WORMWOOD ROOT, *magnified.*

A. The skin with its vessels; small and close.

B, B. The bark, exhibiting a regular system of little cells and sap-vessels.

PART VI. No. 32.

3 P

C, C, C.

C, C, C. Lymph ducts in the bark.

D, D, D. Parenchymatous insertions from the bark, with the cells, &c.

E, E, E. The rays of the wood, wherein the holes are air-vessels.

N.B. This root has no pith.

ASH BRANCH, *magnified.*

A. The bark.

B, B, B. An arched ring of sap-vessels, adjoining the skin.

C, C. The parenchyma of the bark, with its cells, and another ring of sap-vessels answering the former, but situated more internally.

D. A line of lymph-ducts immediately adjoining the second arched ring of sap-vessels.

E, E. The wood.

F. The first year's growth.

G. The second year's growth.

H. The third year's growth.

I. The true wood.

K. The great air-vessels.

L. Lesser air-vessels.

M, M, M. Parenchymatous insertions of the bark, radiating to the centre.

N. The pith.

O. Its bladders or cells.

N. B. The G in the centre should have been O.

VINE LEAF, *magnified.*

Fig. 1. The appearance of the air-vessels to the eye, in a vine-leaf gently drawn asunder.

Fig. 2. A small piece of that leaf.

Fig. 3. The same magnified, in which the vessels have the appearance of a screw.

Fig. 4. The appearance of these vessels as they exist in the leaf before they are stretched out.

VINE LEAF

Fig. 3.

Fig. 1.

Fig. 4.

Fig. 2.

1. The first part of the table is a list of the names of the persons who have been elected to the office of Mayor of the City of New York since the year 1784. The names are arranged in alphabetical order, and the year of election is given in parentheses after each name.

2. The second part of the table is a list of the names of the persons who have been elected to the office of Mayor of the City of New York since the year 1784. The names are arranged in alphabetical order, and the year of election is given in parentheses after each name.

3. The third part of the table is a list of the names of the persons who have been elected to the office of Mayor of the City of New York since the year 1784. The names are arranged in alphabetical order, and the year of election is given in parentheses after each name.

4. The fourth part of the table is a list of the names of the persons who have been elected to the office of Mayor of the City of New York since the year 1784. The names are arranged in alphabetical order, and the year of election is given in parentheses after each name.

5. The fifth part of the table is a list of the names of the persons who have been elected to the office of Mayor of the City of New York since the year 1784. The names are arranged in alphabetical order, and the year of election is given in parentheses after each name.

6. The sixth part of the table is a list of the names of the persons who have been elected to the office of Mayor of the City of New York since the year 1784. The names are arranged in alphabetical order, and the year of election is given in parentheses after each name.

7. The seventh part of the table is a list of the names of the persons who have been elected to the office of Mayor of the City of New York since the year 1784. The names are arranged in alphabetical order, and the year of election is given in parentheses after each name.

8. The eighth part of the table is a list of the names of the persons who have been elected to the office of Mayor of the City of New York since the year 1784. The names are arranged in alphabetical order, and the year of election is given in parentheses after each name.

Part of an ASH BRANCH Magnified.

FLOWERS.

4 - two long
two short

6 - 4 long
2 short

brotherhood

two brotherhoods

many brotherhoods

Syngenesia

both united

one household

separate household

Polygamy

Gryptogamy

FLOWERS.

Trachypogon

Trachypogon

Mouldwings

Stinging Nettle

THE GREAT WALL

VEGETATION

Part of a PEAR Magnified

Natural Size

PART OF A PEAR, *magnified.*

Shewing the rind and its vessels, the calculary and acetary.

A, A, A. The little grains or globules, with the vessels radiating from them.

F L O W E R S,

Two plates; are fully explained by the method of classification according the sexual system in page 358.

M O U L D I N E S S.

This plate exhibits the minuteness of vegetation, and shews, that what we call mouldiness is in reality only a colony of plants. This figure was a spot found on the red sheep-skin cover of a book. The plant has long slender stalks, surmounted by a knob or ball: many of these were round and smooth, as A A; others smooth, but not round, as B; others broken and expanded in various degrees, as C C. The whole was tender, and in substance like the common mushroom. This plant is part of a very numerous tribe, whose limits of duration perhaps are but short, but which compensate this brevity by surprising fecundity and rapid maturity.

STINGING NETTLE.

This shews the whole surface of the leaf, thickly set with sharp thorns and prickles, A A, each consisting of two parts; one sharp and tapering to a point; the other thicker, being a cavity containing a liquor to be ejected from the point into the wound it has made, in the same manner as a viper's fang. B, is a sort of pearl-like transparent globules that grow interspersed on the leaf, much like oak-apples on the leaves of the oak. C C, the ribs or sap-canals, whence all the prickles issue, and which furnish the juice they emit. The smaller prickles have no juice.

OBSERVATIONS on fundry PLATES

Belonging to the SECOND VOLUME of the

SURVEYS OF NATURE.

THE LAPLANDER is represented clothed in skins, and holding a *Rein deer*.

The CHINESE is dressed in silks, *be-dragoned*, according to the custom of his country, as are also his flat sword and his little *queue* of hair.

The AFRICAN is distinguished as well by his colour as his woolly hair.

The HOTTENTOTS are in two groups: that below from *Kolben's* account of the Cape of Good Hope; that above from an original (with remarks) by Dr. *Spaarman*.

The NORTH AMERICAN claims Mr. *West* as its author; the high feathered head, the bow, and the belt of wampum, distinguish him.

WALLACHIAN SHEEP exhibit a remarkable diversity of horns, little to be expected by the specimens of this animal in our country: this race is said to be constant in Crete.

The BLACK WOLF, here represented, was native of Canada, and less than the Alpine wolves.

The FLYING SQUIRREL of this plate is native of India. His attitude shews the membranous expansion between his hind and fore legs, on which his flight depends; (*vide* the Bat). He is larger than the kinds mentioned p. 99; but differs in little else, though his colours and spots vary.

The COAITA is given as exhibiting not only a remarkable formation in the hands, but also as an example of a prehensile tail.

The WHITE BEAR is the great Greenland bear, not the terrestrial white bear.

The ANT-BEAR. The snout of this animal is too long by a quarter its length, (stuffed skins are apt to occasion such mistakes); also it should taper more at the end: the streaks on the back are too distinct.

The BAT, *fig. 1.* Represents this creature in a state of repose. The front-arm (A C) is very long, extending obliquely downwards and forwards to the nose; the knuckle (C) rests on the ground, and the thumb only (D) appears; the knee (B) is elevated up to the back (E); the leg is vertical, and the five toes (G) of the hind leg are of equal length and

The Cut-water *or* Scissors-bill

and diverging. In this view many parts are hidden by others coming before them. That by this almost contradictory conformation of parts, the bat should be a heavy walker, and indeed rather drag itself along than walk, is no wonder; his gait is tottering, and he is often in danger of falling sideways.

Fig. 2. Shews this animal in a flying state; to accomplish which he spreads his fingers (or those long *radii* from M), and extends his membranous sides, which are so thin they are almost transparent, yet very strong. A the arm, B the fore arm, M the thumb, C, D, E, F, the extended fingers, which are further separated from each other in the order mentioned; the membrane between these assumes a *hollowed* form, G, H, I, K (near the tail L). When the bat ceases flying, he shuts the fingers close on the fore-arm, thereby folding the membrane into a small compass, and presenting to the air a less surface, yet equal weight, he descends and reposes. Other flying creatures have no such long *radii* of fingers (vide *Flying Squirrel*).

The FLAMINGO. The head of some is rather smaller in proportion.

The AVOCETTA. All birds bills of this kind do not turn up equally, but some more, some less, and are not of equal length.

The COMBATANT is given in both states, to exhibit the remarkable dissimilarity of this bird when full feathered and when moulted.

The CUT-WATER. This bird, from the conformation of his bill, which is composed of two very unequal pieces, can neither peck nor gather his food: his upper mandible falls into his lower, like the blade of a razor into its hilt, so that the bird is reduced to glide over the surface of the sea, and with his lower mandible furrow the water, in order to catch such fish as are near, or on, the surface; hence his name. The point of his bill is black; near the head red, as are his feet: size of a small sea-mew. The upper part of his body, the front of his neck, and forehead, white; some white on his wings; the rest of his plumage black, or brown-black, more or less. Inhabits Carolina and Guyana; go in troops; almost always on the wing: their wings are long, yet they fly slowly, the better to perceive and seize their prey.

The OSTRICH. The neck of some is rather longer in proportion.

The CROCODILE given in the plate, is the *long-snouted* crocodile; or that of the Ganges; which is similar to the Siamese described in page 151.

The GUANO. His pouch is in its swelled state; the risings on his back are rather too strongly marked, and rather too much in lines.

The CAMELEON is in his puffed-up state.

The RATTLE-SNAKE, plate II. shews the peculiar parts of this reptile, separated and distinct.

The *head*. At the extremity are the nostrils (A); between them and the eyes are (B) two orifices suspected to be the organs of hearing, but which lead into a bone, hollow, but not perforated C, shews the teeth of this serpent seated in each jaw. D, the fangs through which the poison passes, placed forward in the mouth: only the first (which is the largest) fixed to the bone, the others to tendons; their mechanism has been described. E, the situation of the bladders of poison. F, the larynx, not with a variety of cartilages, but formed so as to make a slit for the admission of air; whence the hissings of serpents. G, the forked tongue, composed of two round bodies, joined two thirds of its length; the part outside the sheath is black, that within it red: the under jaw is here divided (as at I) for its readier passage, and the teeth in this jaw (H) are on each side this division, that they may not injure the tongue.

The *Rattle*. The formation of the first rattle. *a*, the latter vertebra of the tail: *b*, the muscle on which the rattle is fastened: *c*, a single rattle, shewing its risings whereby it is held by following rattles, being inserted into their hollows; also its hollows whereby it holds the risings of the following rattles: *d*, five rattles joined together, viewed as they appear externally.

The *poisonous fangs* are given at large, that their orifices, form, and construction may appear more plainly.

The SWORD-FISH frequents our coasts, but is more abundant in the Mediterranean, where its fishery is a considerable object, especially on the coast of Sicily, near Italy. It is much esteemed by the Sicilians. The season is in summer. They are struck with a spear; are said to be very voracious, and great enemies to the tunny, who are affirmed to be terrified at the sight of them, probably for the same reason as the whale is at the saw-fish. It grows very large: the head and pectoral fins of one weighing seventy pounds; the snout three feet long, rough and hard, but not enough to penetrate ships. The snout is the upper jaw greatly prolonged; it is compressed at top and bottom, sharp at the point: the under jaw is sharp but short; no teeth: the skin is rough but very thin: colour of the back dusky; the belly silvery.

The Sword-fish.

SEA STARS

SEA PENS

PINNA MARINA.

This is of that kind whose edges are rounded; it is the largest known, being usually two feet in length, sometimes more: it attaches itself to rocks by long strings not unlike silk, which are called *byssus*, and used for making some kinds of stuffs.

P H O L A D E.

This class of shell-fish vary in the number of pieces which form their shell; some have four, others five, and some eight.

This figure is composed of eight pieces, viz. two large ones, D D; two others long and thin E E, placed toward the opening of the shell; a very small one indicated by F F, uniting the above; and a long slip G adjoining to F, and running down the shell: beside these are two others channelled, and running down the internal face of the shell. This shell is entirely white; the two large pieces slightly channelled.

N A U T I L U S.

This figure represents the shell internally and externally. The chambers of the first deserve our notice: they are separated by thin partitions, pierced, each in its centre, by an orifice of communication running throughout the whole. The colour of this shell is yellowish, with cross bands deeper coloured, and almost brown.

S E A S T A R S.

Are marine animals divided into many points or rays, but generally five; they are covered by a skin, more or less tough, hard, or leathery. If one of their rays be broken off, they regain the deficiency in a little time, sometimes growing from the place of the old one, sometimes from one side of it.—The under face in almost all kinds is different from the upper, and concave or hollow; while the upper is convex, and mostly smooth, having no channels. The mouth is in the under face.

Of the first of these the rays are divided by deep channels, fringed as it were by points, thin and flattened; the whole of this face is covered by little grains the size of a small pin's head. Inhabits most seas.

The second has much thinner rays, with longer fringes, cylindrical and pointed; the part between is covered above and below by little thin plates, disposed like the scales of a fish; the centre or body is granulated, extremely finely, both above and below. The colour of this subject is brown. Is found at St. Domingo.

S E A P E N S

Are a kind of marine insects, denominated from their resemblance to a writing pen: the middle, which corresponds to the *quill* of the pen, is a cartilaginous substance, in colour a clear brown; the *feathers* of the pen are whitish, hollow like the body, but less solid, and partly allied to the rays of sea stars. The flesh of the animal occupies the whole; is at least the size of a pen, often more. Is found in the East Indies.

The second differs from the former in having its lateral branches or feathers furnished with other smaller filaments, very thin: its colour varies from red to white; the reddest are most desired. Is found as well in the European as Indian seas.

S E A U R C H I N S

Are distinguished from sea stars by not being divided into rays, but having numerous spikes issuing from small knobs disposed over the surface. If one of these points or spikes be broken off, they regain the deficiency. It has been hinted by some, that possibly they change their shell like crabs, &c.: it is certain that, when broken or pierced, they quickly restore it. Some are quite flat, and have no points. The mouth is on one side, the anus on the other, commonly directly opposite.

No. 1. Is not round, but approaching to oval, flat on one side, convex on the other: its convex side is represented; its mouth is on the other side: colour brown. It has a great number of very fine and short ash-coloured points: four deep fissures on its convex side, none on its flat side. Found at St. Domingo.

No. 2. Is seen on that side where its mouth is (which has five teeth): this urchin has two sorts of points, one short, flattened, smooth, and whitish; the other much longer, of an unequal or roughish surface, and reddish colour. Is found in America.

No. 3. Has a very great number of points, principally on the convex face and sides; is of a fine violet colour. Found in the Mediterranean.

No. 4. Is very convex on one of its faces; the opening seen is the anus. The colours of this urchin are stripes of green and white alternately. The little knobs which cover its surface have usually each a little spike of a quarter of an inch long; some green, some white: these break off easily when the animal is dead. Native of the West Indies.

No. 5. Is extremely thin and flat; thickest in the middle, thinnest toward

Eyes of a Fly

toward the edge: the mouth and anus are both on the same face, and near together. On the upper face the figure of a five-petaled flower: around it six oval openings, having no apparent communication with the internal parts; points only within these openings. Native of the West Indies.

No. 6. Is white and flat, like the foregoing; differs by a kind of incisions which almost resemble the appearance of a fringe; in other respects is similar.

THE HEAD AND EYES OF A DRONE FLY, *magnified*.

This insect is remarkable for a large head and clusters of eyes: the greatest part of the head consists of two semi-circular protuberances or eyes, A, B B, C C, D D; whose surfaces are replete with minute hemispheres disposed triagonally, forming exact and equi-distant rows, with little channels between them. Those in the upper divisions A, B, C, much larger than those in the lower divisions C, D. Every one of these seems very nearly an *exact* hemisphere, reflecting the images of surrounding objects; insomuch that houses, trees, &c. within a certain distance, appeared depicted on it, in the same manner as the windows are on the figure above.

There were 14,000 pearls or hemispheres in these clusters; 3000 of the larger kind, 4000 of the smaller kind, in each protuberance. Each pearl is an eye, having the necessary humours, &c. yet probably the creature has vision only of such objects whose rays of light fall nearly coincident with the axis of the hemisphere; and of these some may engage its attention more than others.

In the *Libella*, or *Dragon Fly*, Mr. LEUENHOEK reckoned 12,544 pearls in each eye, placed hexangularly; he also numbered 6236 pearls in a *Silk-worm's* two eyes when in a fly state; 3181 in each eye of a *Beetle*; and 8000 in the two eyes of a common *Fly*.

In flies and aerial animals the pearls are placed in triangular rows; in *Crabs*, *Lobsters*, *Shrimps*, and other crustaceous water animals (whose eyes are less pearly) they are ranged in a quadrangular order: the loss in number being compensated by a small power of moving their eyes when inspecting objects.

F F. The horns.

G G. The smellers or feelers.

H H I. The proboscis.

K. Hairs and bristles.

The BLUE-BOTTLE FLY, *magnified.*

a. Its protuberant pearled eyes.

b. The forehead, scaly and prominent between the eyes, furnished with strong black bristles; from this grow two oblong parts *dd*, having joints into the forehead. These in the head of the drone fly were called *horns*.

ee. Tufts of bushy bristles or feathers growing from *dd*.

ff. Four strong bristles placed in pairs, and bending toward each other just above the opening of the mouth.

ghi. The trunk or proboscis issuing from the middle of the mouth, apparently hollow, and by its joints projected or withdrawn at pleasure. From *b* to *i* seems divided into two lips, covered with hairs; these lips open or shut easily, and hold little pieces of solid food; but when the fly sucks liquid, she spreads them open, and applies their hollow part to the body on which such liquid is, as on fruit, &c. whereby they become a kind of pump.

kk. Two little hairy oblong projections growing within the mouth, on each side the proboscis; thought by Dr. Hooke to be the organs of smelling or feeling (as *GG*, in the foregoing plate).

The thorax of this fly is crustaceous, strongly made, its bristles standing backward like the quills of a porcupine; has six legs, covered with a hairy shell, each having eight joints, at the end of which are its claws, and soles which are spungy.

Of these six legs the fly seldom employs more than four to walk with; the two foremost answering many of the purposes of arms and hands.

The TUFTED GNAT, *magnified.*

a. Its head, small in proportion to its body, consisting chiefly of two clusters of pearled eyes: just over these eyes, and somewhat between them, are two black balls, from whence issue two long horns, tapering and jointed like the horns of a lobster; from these joints arise small stiff hairs in a regular order.

b. Is two other jointed horns, or feelers, projecting over the proboscis *c*, which is a case covered with long scales, and, when not in use, concealed under the throat: its side opens, and emits four darts occasionally, one being a sheath to the other three: they are barbed toward the point. This head, with its appurtenances, is united to the thorax by a short neck.

The Blue-bottle Fly
Magnified

Cheese-Mite

Feather-winged Moth

The legs are long and slender, in number six, and having six joints; the feet are feathered, in a manner resembling the scales of a fish, with many bristles interspersed: the wings are edged with a fringe of feathers; under each wing appears a projecting body, thought to be a poise or balance *d*, rounding at its extremity and under the wing. The belly of the creature is long, in nine divisions; six of them transparent, the other three at the end opaque. A small, clear, white part *g* is seen beating like the heart in large animals.

The FEATHER-WINGED MOTH, *magnified*.

This is a small white moth, sometimes found on the nettle: it has four wings, each divided, very elegantly fringed on both sides with exceeding small white hairs, their stems inclining backward and downward. The body, legs, horns, and stems of the wings, are covered over with feathers of different shapes and sizes, which come off when touched. *A*, represents one of these feathers; *B*, one of those stalks which fringe the edges of the wings.

CHEESE MITE, *magnified*.

BACK. Shape nearly oval, but obtuse; the back covered with one entire shell, so curiously polished that it reflects the pictures of all objects around it. The upper parts of the creature are distinct shells, and capable of being drawn in or thrust out; as is also its snout.

BELLY. This shews the under parts of a mite; the head is small, has two eyes; the mouth resembles that of a mole, appearing red within; has bristles at the snout; is sometimes seen munching and chewing the cud, like a Guinea-pig: has eight legs covered with a very transparent shell; each has eight joints, and a very sharp hook or claw at the end; four of these legs move the body forward, the other four backward, when necessary: they are male and female, are oviparous, shed their skins several times, but never change their forms.

F I N I S.

The legs are in order, in number six, and having six joints; the feet are furnished, in a manner resembling the scales of a fish, with many small bristles: the wings are edged with fine hairs of a silver; each wing appears a perfecting body, thought to be a pole of magnetism, extending to its extremity and under the wing. The belly of the creature is long, in nine divisions; five of them transparent, the others opaque as the end of a stick. A small, clear, white part is seen beating like the heart in large animals.

THE FEATHER-WINGED MOTH, *megastis*.

This is a small white moth, sometimes found on the nuptial: it has four wings, each divided, very elegantly fringed on both sides with exceeding small white hairs, their stems inclining backward and downward. The body, feet, horns, and heads of the wings are covered over with feathers of different shapes and sizes, which come off when touched. A, represents one of these feathers; B, one of those which fringe the edges of the wings.

CHEESE MITE, *megastis*.

Back. The mite is nearly oval, but obtuse; the back covered with a fine, to variously polished, and it reflects the colours of all objects around it. The upper part of the creature are distinct itself, and the whole of being drawn in or drawn out, as it is its front. The mite shows the upper part of a mite; the head is small, has two eyes; the mouth resembles that of a mole, appearing red within; the lower part of the mite is sometimes seen underneath and chewing the soil. The mite is covered with a very transparent film; each has eight joints, and a very sharp hook or claw at the end; four of these joints are the body forward, the other four backward, when the mite is drawn out, and the mite, are ovipositors, that their form.

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