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THE
SYSTEM
OF
NATURAL HISTORY,
WRITTEN BY
M. DE BUFFON,
Carefully Abridged :
AND THE
NATURAL HISTORY OF INSECTS;
COMPILED CHIEFLY FROM
SWAMMERDAM, BROOKES, GOLDSMITH, &c.
EMBELLISHED WITH
Elegant Engravings on Wood.
IN FOUR VOLUMES.

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VOL. I.  
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ALNWICK :
PRINTED BY AND FOR W. DAVISON.

1814.

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P R E F A C E.

NATURAL HISTORY is, of all sciences, the most important and extensive. Its object is, to observe and classify the various appearances of nature, as they present themselves spontaneously, while undisturbed by the intervention of human art. The general phenomena of the universe, the wonders of the heavens, the form and structure of the earth, animals, vegetables, fossils, and inanimate bodies of all species, fall, therefore, under its observation. Whatever can be discovered of any of these, by an attentive survey ; or by carefully watching those changes to which they are naturally subject, is recorded by the naturalist, in order that it may be added to the materials of some other science or some art, or that it enlarge the general experience of mankind.

Although thus important, thus extensive, and thus generally interesting, it was late in the progress of knowledge, before natural history assumed a regular form, or began to be cultivated as a distinct branch of science. Many theories of the earth and heavens had been imagined ; the science of ethics had been successfully cultivated in all its different branches ; the most important theorems in mathematics had been demonstrated, and the most intricate problems solved ; when Aristotle, the father of natural history, first attempted to collect a body of facts belonging to this department of knowledge, and to arrange them in scientific order. Taste and genius had passed their meridian at Rome,

when the elder Pliny collected that medley of science and fable, which is the only valuable work upon natural history that the remains of Roman literature afford. And, in modern times, the great masters of almost every other science had passed, before Buffon and Linnæus appeared.

But if natural history did not, till a late period, begin to assume a regular form, or to command the attention of the votaries of knowledge ; it has at length become a favourite study with almost all classes of men. The philosopher finds no task more pleasing, than to watch and compare the habits and manners of plants and animals. The virtuoso rejoices in the possession of a shell, a skeleton, or a stuffed skin, no less than in a rusty medal, a faded picture, or a mutilated statue. The painter and the engraver have exhibited some of the finest specimens of their respective arts in imitating the forms and colours of birds and quadrupeds. And what a numerous train of writers have lately sought fame or emolument, by illustrating subjects of natural history !

Linnæus and Buffon, the chief of these last, have equally displayed, in their works, some of the highest efforts of genius ; although differing as much in their views, and manner of composition, as is possible for two able writers, upon the same train of subjects. The one has reduced natural history to the austere regularity of scientific method : while the other has displayed its materials in a loose order, and arrayed them in all the pomp of popular eloquence. The one has formed a new classification, and invented a new system of technical language, as apparatus for his favourite science : the other, in complianee with the taste of his country, and the turn of his own genius, has endeavoured

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to strip natural history of whatever is remote from popular expression and popular ideas, and to teach her those blandishments, which invite and insinuate, and attract the notice, and even the regard of the gay, the careless, and the indolent. Buffon, like most other eminent philosophers of France, intermixes ill-founded, and fantastic theory, in a large proportion, with extensive and enlightened views of nature, and the most beautiful delineations of facts. Linnæus seems to have proposed to himself to form simply an index to these parts of the volume of creation which are open to human view. Both are eminently eloquent; but the eloquence of Buffon is copious, diffusive, and often declamatory and redundant: while Linnæus is remarkably concise and energetic. Yet whatever may be their comparative merits, Buffon will long continue one of the most popular writers on scientific subjects: but, it is not probable, that the volumes of Linnæus will ever be fondly perused by any but men of science.

These views of the importance and extent of natural history, of the ardour with which it is, at present, cultivated, and of the character of the most popular of the capital writers upon the science, first suggested the idea of the **PRESENT ABRIDGMENT**. It seemed probable, that the work of Buffon might become still more popular, and of consequence, more generally useful, if it could be reduced to a less bulky and less expensive form. It was natural to observe, that of those who are desirous of acquiring some knowledge of natural history, or of amusing themselves with the contemplation of the objects which it presents, many are unwilling to be detained by theory, however plausible, to listen to amplifying declamation, or to perplex them-

selves with examining authorities, or balancing the evidence on the different sides of disputed facts. To the young it is peculiarly proper to recommend the study of natural history ; and nothing but a detail of interesting facts, in easy, correct, and perspicuous language, can be put, with any prospect of utility, into their hands.

The compiler of this Abridgment has been guided by these considerations in the performance of his task. He has rejected, as far as was practicable, without destroying the contexture of the work, all such of Buffon's theories as appeared to him plainly ill-founded and fanciful : he has left out that display of authorities which Buffon had not always confined to his notes, but frequently introduced into the text : and he has often condensed his author's diffuse descriptions of the forms and manners of animals, and abbreviated his narrative of historical facts relative to them. He has at the same time anxiously endeavoured to make this Abridgment, a regular work, having consistency and connexion through all its parts, not an awkward heap of incoherent fragments. In the latter part, some additions are introduced from other writers, and to the whole is subjoined the **NATURAL HISTORY OF INSECTS**, compiled chiefly from *Swammerdam*, *Brookes*, and *Goldsmith* ; and intended as a suitable companion to the present Abridgment of Buffon's Work.

NATURAL HISTORY.

CHAP. I.

OF THE EARTH--ITS FORM AND COMPOSITION--OF AT-
TRACTION—REPULSION—ELEMENTS
—HEAT—AIR—WATER.

THE figure of the earth, its motions, or the external relations which subsist between it and the other parts of the universe, belong not to our present inquiry. It is the internal structure of the globe, its form and manner of existence, that we here propose to examine. The general history of the earth ought to precede that of its productions. Details of particular facts relating to the economy and manners of animals, or to the culture and vegetation of plants, are not, perhaps, so much the objects of natural history, as general deductions from the observations that have been made upon the different materials of which the earth itself is composed; as its heights, depths, and inequalities; the motions of the sea, the direction of mountains, the situation of rocks and quarries, the rapidity and effects of currents in the ocean, &c. This is the history of nature at large, and of her principal operations, by which other inferior or less general effect is produced. The theory of these effects constitutes what may be called the primary science, upon which a precise knowledge of particular appearances, as well as of terrestrial substances, solely depends.

With regard to the history of the earth, therefore, we shall begin with such facts as have been universally acknowledged in all ages, not omitting those additional truths that have fallen within our own observation.

The surface of this globe presents us with heights, depths, plains, seas, marshes, rivers, caverns, gulfs, volcanoes, in the disposition of which, upon a slight view, we observe neither regularity nor order. If we penetrate into the bowels of the earth, we discover metals, minerals, stones, bitumens, and, in short matter of every kind as it were without any apparent design. Upon a more accurate inspection we perceive matter in every form, blended in a chaos of confusion, which can be compared to nothing but the ruins of a world.

Amid these ruins, however, the different generations of animals, and of vegetables, succeed each other in a beautiful and regular order. With respect to us, the earth, formerly a chaos, is now become a delightful habitation, where every object affords amazing displays of the power, of the intelligence, and of the beneficence of its great Creator.

Astronomers tell us, that this earth which we inhabit forms but a very minute part in that great assemblage of bodies of which the world is composed. It is a million of times less than the sun, by which it is enlightened. The planets also, which, like it, are subordinate to the sun's influence, exceed the earth one thousand times in magnitude. These have been discovered as forming, with our earth, a system of bodies circulating round the sun, all obedient to one law, and impelled by one common influence.

Modern philosophy has taught us to believe, that, when the great Author of Nature began the work of

creation, he choose to operate by second causes ; and that, suspending the constant exertion of his power, he endued matter with a quality, by which the universal economy of nature might be continued without his immediate assistance. This quality is called attraction ; a sort of approximating influence, which all bodies, whether terrestrial or celestial, are found to possess ; and which in all increases as the quantity of matter in each increases. The sun, by far the greatest body in our system, is, of consequence, possessed of much the greatest share of this attracting power ; and all the planets, of which our earth is one, are, of course entirely subject to its superior influence. Were this power, therefore, left uncontrouled by any other, the sun must quickly have attracted all the bodies of our celestial system to itself ; but it is equally counteracted by another power of equal efficacy ; namely, a progressive force which each planet received when it was impelled forward by the divine Architect upon its first formation. The heavenly bodies of our system being thus acted upon by two opposing powers ; namely, by that of attraction, which draws them towards the sun ; and that of impulsion, which drives them straight forward into the great void of space ; they pursue a track between these contrary directions : and each like a stone whirled about in a sling, obeying two opposite forces, circulates round its great centre of heat and motion.

In this manner, therefore, is the harmony of our planetary system preserved. The sun, in the midst, gives heat, and light, and circular motion to the planets which surround it. Though we see the greatness and wisdom of the Deity in all those worlds around us it is our chief concern to trace Him in that which we inhabit.

In examining and describing the surface of the earth the first object which solicits our attention is that body of water with which the greater part of the globe is covered. The waters occupy the lower grounds, and notwithstanding their uniform tendency to rest, they are kept in continual agitation by an agent, that communicates to them a regular periodic motion, which produces a vibration, even to the most profound depths in the whole mass.

When we explore the bottom of the sea, we discover hills and valleys, plains and hollows, and rocks and earths of every sort. We discover too that islands are only the summits of vast mountains; we likewise find other mountains whose tops almost reach the surface of the water; and rapid currents which counteract the general movement; and of which the motion is sometimes in the same direction, and at other times retrograde. On the one hand, we meet with tempestuous regions, where the heavens and the ocean seem equally confounded in the general shock; violent intestine emotions, tumultuous swellings, water-spouts, and strange convulsions produced by volcanoes, and dreadful whirl-pools. On the other hand, we discover vast regions always calm, but equally dangerous to the mariner. In short, when we direct our eyes towards the polar regions, we perceive huge masses of ice, which having detached themselves from them, advance, like floating mountains, till they dissolve in the temperate climates.

Besides these grand objects, the ocean exhibits an infinite variety of animated beings; all of which find abundance of food in this fluid element.

But when we take a view of the land, what differences take place in different climates! what a variety

of soils ! what inequalities in the surface ! Yet upon an attentive observation, we observe that the great chains of mountains lie nearer the equator than the poles ; that, in the old Continent, their direction is more from east to west than from north to south. And the figure and direction of these mountains which appear most irregular, correspond so, that the prominent angles of one mountain are constantly opposite to the concave angles of the neighbouring mountain, and of equal dimensions, whether they be separated by an extensive plain or a small valley. I have remarked that the opposite are almost always of the same height ; and that mountains for the most part occupy the middle of continents, islands, and promontories, and that they divide them by their greatest lengths. By tracing the courses of the principal rivers, I find that their direction is nearly perpendicular to the sea-coasts into which they empty themselves, and that for the greater part of their courses they follow the direction of the mountains from which they take their rise. The sea-coasts are generally bordered with earth and sand accumulated by the waters of the sea, or swept down by rivers. In opposite coasts, separated only by small arms of the sea, the different strata are of the same materials. Volcanoes never exist but in high mountains ; a great number of them are entirely extinguished ; some are connected with others by subterraneous passages, and their eruptions pretty frequently happen at the same time. Similar communications subsist between certain lakes and seas. Some rivers disappear on a sudden and seem to precipitate themselves into the bowels of the earth. Certain inland seas, too, constantly receive from many rivers prodigious quantities of water, and which, as their

bounds are not augmented, probably discharge those extraneous supplies by subterraneous passages. Countries that have long been inhabited may likewise be easily distinguished from those where the earth appears in a rude state, where the rivers are full of cataracts, where the land is either almost overflowed with water, or scorched with drought, and where every place where a tree can grow is covered with wood.

In our examination of the upper stratum of the earth, we find it to be universally the same substance which substance is nothing else than a composition of the decayed parts of animal and vegetable bodies. Penetrating a little deeper, we discover the real earth, beds of sand, lime, stone clay, shells, marble, gravel, chalk, &c. These strata are always parallel to one another, and of the same thickness throughout. In neighbouring hills, strata of the same materials are uniformly divided by perpendicular fissures. Shells, skeletons of fishes, marine plants, &c. perfectly similar to those of the ocean, are often found in the bowels of the earth, and on the tops of mountains at very great distances from the sea. Petrified shells are found almost every where in prodigious quantities, not only inclosed in rocks of marble and limestone, in earths and in clays, but incorporated and filled with the very substances in which they are inclosed. Indeed all marbles, lime-stones, chalks, marles, clays, sands, and almost all terrestrial substances, are full of shells and other spoils of the ocean.

From these facts, let us try what conclusions can be drawn.

The changes which the earth has undergone for the last two or three thousand years, are inconsiderable, when compared with those revolutions which succeed

the creation. For as the surface of the earth was at first much softer than it is now, of consequence the same cause which at present produce but slight alterations for many centuries, were then capable of producing very great revolutions in a few years. It is very evident, in my opinion, that the dry land, and even the summits of the highest mountains, were formerly covered with the waters of the sea ; because shells and other marine animals are still found upon the very tops of mountains. It appears too that the waters of the sea have remained a great number of years upon the surface of the earth ; for such immense banks of shells have been discovered, as to render it impossible for so great a number of animals to have existed at the same time. This circumstance proves pretty clearly, that, though the materials on the surface of the earth were then easily disunited by the water, yet these transportations could not be suddenly effected. Even though it should be supposed, that, at the deluge, all the shells were transported from the bottom of the ocean and deposited upon the dry land ; yet, besides the difficulty of establishing this hypothesis, it is evident, that as shells are found incorporated in marble, and in the rocks of the highest mountains, we must likewise suppose, that all these marbles and rocks were formed at the same time, and that too when the deluge took place ; and that before this grand revolution, there were neither mountains, nor marbles, nor rocks, nor clays, nor matter of any kind like that with which we are now acquainted.

But without dwelling any longer upon this particular I shall confine myself to well authenticated facts. It is certain, that the waters of the sea have, at one period or other, continued for a succession of ages upon

what we now know to be dry land ; and that, of consequence, the vast continents of Asia, Europe, Africa, and America, were then the bottom of an immense ocean, replete with every thing which the present one produces. It is also certain that the different strata of the earth are horizontal and parallel to one another, which situation is occasioned by the operation of the waters. The horizontal position of water is almost universal ; in plains the strata are perfectly horizontal. And it is only in the mountains that they are inclined to a horizon ; because they have been originally formed by sediments deposited upon an inclined base. Now these strata must have been formed gradually ; for nothing is more frequent than strata composed of heavy materials placed above light ones, which could not have been the case, if the whole had been blended and dissolved by the deluge, and then precipitated.

Another circumstance requires our attention. Nothing but the motion and sediments of water could possibly produce the regular position of the various strata of which the superficial part of this earth is composed. And as both the highest mountains, and the lowest vallies consist, of parallel strata, this parallel and horizontal position of strata must be the effect of an uniform and constant cause. And hence we conclude that the dry and habitual part of the earth has remained a long time under the waters of the sea, and must therefore have undergone the same changes which are at present going on at the bottom of the ocean. By examining therefore what passes in the bottom of this sea, we shall soon be able to draw some rational conclusions respecting the external figure and internal constitution of the earth.

The ocean, since the creation of the solar system, has been subject to a regular flux and reflux. This motion, which uniformly takes place twice in twenty-four hours, is principally owing to the moon, and is greater in the equatorial regions than in other climates. The earth too performs a rapid motion on its axis, and consequently has a centrifugal force, which is also the greatest at the equator; which last circumstance proves that the earth must be more elevated under the equator than at the poles. From the tides, therefore, and the motion of the earth combined, we may fairly conclude, that, though this globe had originally been a perfect sphere, its diurnal motion, and the ebbing and flowing of the tides, must, in a succession of time, have elevated the equatorial parts, by gradually carrying mud, shells, &c. from other climates, and depositing them at the equator. On this hypothesis, the greatest inequalities on the earth's surface ought to be found and indeed are found near the equator. But farther, as the alternate motion of the tides has been regular since the existence of the world, may we not naturally imagine, that, at each tide, the water carries from one place to another a small quantity of matter, which falls to the bottom as a sediment, and forms those horizontal and parallel strata that every where appear.

It may, however, be objected, that as the flux is equal to, and regularly succeeded by the reflux, the two motions will balance one another, and, of consequence, that this cause of the formation of strata must be chimerical, as the bottom of the ocean can never be affected by a uniform alternate motion of the waters.

But, in the first place, the alternate motion of the waters is far from being equal, as the sea has a continual motion from east to west, and also as the agi-

tations occasioned by the winds produce great inequalities in the tides. By every motion of the sea too, particles of earth, and other materials, must be carried from one place and deposited in another; and these collections of matter must assume the form of parallel and horizontal strata. Besides, on all coasts where the ebbing and flowing are discernible, numberless materials are brought in by the flux, which are not carried back by the reflux. Thus the sea gradually increases on some places, and recedes from others. But in order to remove every doubt, let us examine more closely the practicability of a mountain being formed at the bottom of the sea, by the motion and sediments of the water. On a coast which the sea lashes with violence, some part of the earth must be carried off by every stroke of the waves. Even where the sea is bounded by rock, it is a well authenticated fact, that small particles are carried off from the rock by the retreat of every wave. Those particles of earth or stone being transported to some distance, it happens that, when the agitation of the water is abated, the particles are precipitated in the form of a sediment, and lay the foundation of a first stratum, which will soon be succeeded by a similar one. In process of time this gradually accumulating mass will become a mountain in the bottom of the sea, perfectly like, both in external and internal structure, the mountains on the dry land. When the bottom of the sea too, at particular places, is troubled by the agitation of the water, earth, clay, shells, and other matter must be removed from thence, and deposited elsewhere. For divers assure us, that the bottom of the sea, at the greatest depths to which they descend, is so strongly agitated by the water, that earth, clay,

and shells, are removed to great distances. Transportations of this kind must therefore go on in every part of the ocean; and the matters transported, after having subsided, must raise eminences similar to the composition and structure of our mountains. We must not however imagine that these matters cannot be carried to a great distance; for we daily find grain, and other productions of the East and West Indies, landing on our coasts. These bodies may be said to be specifically lighter than the water, and the other substances specifically heavier. Yet as they are reduced to an impalpable powder, they may be long suspended in the water, and consequently transported to any distance.

It has been imagined that the agitation, produced by the winds and tides, does not affect the bottom when it is very deep. But the truth is, that whatever be the depth, the power which occasions the flux and reflux operates equally upon every particle of the mass at the same time. It therefore appears that the tides, the winds, and whatever else gives birth to motion in the sea, must produce heights and inequalities in its bottom; and that these eminences must uniformly be composed of regular strata, either horizontal or inclined.

Whenever eminences are formed they interrupt the uniform motion of the waters, and produce new ones called currents. Between two neighbouring heights in the bottom of the ocean, there must be a current which will follow their common direction, and, like a river, cut a channel, the angles of which will be alternately opposite through the whole of its course. These heights must continually increase, as the water will deposit its ordinary sediment upon their ridges;

and thus, by means of the different motions and sediments, the bottom of the ocean, though formerly smooth, must soon be furrowed, and interspersed with hills and chains of vast mountains, as we find it at present. And the materials which consisted of sandy and crystalline particles, would produce those masses of rock and flint in which we find crystals and precious stones. Others composed of stony particles and shells, produce lime stone and marble; and, lastly, particles of shells mixed with a pure earth, have given rise to all our beds of marle and chalk.

It may be said, however, that the greater number of hills, whose summits consist of solid rocks of moor stone, or marble, are founded upon small eminences composed of lighter materials. But the explication of this phenomenon is perfectly easy. The waters would first operate upon the upper stratum, either of coasts, or the bottom of the sea. This upper stratum generally consists of clay or sand; and these light substances being carried off and desposited sooner than the more dense and solid, they would of consequence become foundations for the more heavy particles to rest upon. The harder and more ponderous substances would next be subjected to the attrition of the water, and carried off and deposited about the hillocks of sand or clay. These small stony particles would, in process of time, form those solid rocks which we now find on the tops of hills and mountains. And as particles of stone are heavier than those of either sand or clay, it is probable that they were originally covered by superior strata of considerable depth; but that they now occupy the highest stations, because they were last transported by the waves.

To confirm this reasoning, it is worthy of remark, that the different strata of stones in quarries are almost all horizontal or regularly inclined. Indeed the strata of granite vitrifiable sand, clays, marbles, calcareous stones, chalk, and marles, are always parallel or equally inclined; and the disposition of strata, as deep as mankind have penetrated is the same.

Those beds of sand and gravel which are washed down from the mountains, must, in some degree, be excepted from the general rule. And as they are formed by rivers and brooks which often change their channels, it is not surprising that they are so frequent. The strata formed by rivers are not very ancient; they are easily distinguished by their frequent interruptions, and the inequality in thickness, which is constantly varying, but the ancient strata uniformly preserve the same dimensions throughout. These modern strata may likewise be distinguished by the form of the stones and gravel they contain, which bear evident marks of having been rounded by the motion of water. The same observation holds good with respect to those beds of turf, and corrupted vegetables, which are found in marshy grounds, immediately below the soil; and which have derived their origin from successive accumulations of decayed trees, and other plants. The strata of slime and mud being formed by stagnating waters, or the inundations of rivers, are neither so perfectly horizontal, nor so uniformly inclined as those produced by the regular motions of the sea. In strata formed by rivers, we meet with river and seldom with sea shells; but in the ancient strata there are no river shells; the sea shells are numerous, well preserved, and all placed in the same manner. From whence could this beautiful regularity proceed? Instead of regular strata, why do

we not find the materials which compose the earth huddled together without order? Why are not rocks, marbles, clays, marles, &c. scattered promiscuously, or joined by irregular or vertical strata? Why are not heavy bodies found in a lower situation than light ones? It is easy to perceive, that this uniformity of nature, this species of organization, this union of different materials by parallel strata, without regard to their weights could only proceed from a cause equally powerful and uniform as the motions of the sea, produced by regular winds, or by the flux and reflux, &c.

As these causes act with superior force under the equator than in other climates, the chains of mountains are most extensive in its neighbourhood. Thus the mountains of Africa and Peru are both the highest and most extensive in the world. The mountains of Europe and Asia, which extend from Spain to China, are not so high as those of Africa and South America. Besides, in the northern seas, the islands are but few, when compared with those in the Torrid Zone. As islands, therefore, are nothing but the summits of mountains, it is clear there are more inequalities on the surface of the earth near the equator than in northerly climates.

Those vast chains of mountains which run from west to east in the old continent, and from north to south in the new, must have been formed by the general motion of the tides. But the origin of smaller mountains and hills may be ascribed to particular motions occasioned by winds, currents, and other irregular agitations of the sea, or to a combination of all those motions which are capable of infinite variations.

But how has it happened that this earth, which, from time immemorial, has been an immense continent,

should, if formerly the bottom of an ocean, be now so much elevated above the waters, and so completely separated from them?

A little reflection will furnish us with at least plausible solutions. We daily observe the sea gaining ground on certain coasts, and losing it on others. The ocean has a general and uniform motion from east to west; there are whole provinces which human industry can hardly defend from the fury of the waves, and there are islands which have but lately emerged from the waters, and regular inundations. History too informs us of inundations and deluges of a more extensive nature. Should not all this convince us, that the surface of the earth has undergone very great revolutions, and that the sea may have given up the greater part of the ground which she formerly possessed? Let us suppose for example, that the old and new worlds were formerly but one continent, and that, by a violent earthquake, the ancient Atalantis of Plato was sunk. What would be the consequence? The sea would rush in from all quarters, and from what is now called the Atlantic Ocean, and vast continents would of consequence be left dry. This great revolution might be effected by the sudden failure of some immense cavern in the interior part of the globe, and an universal deluge would infallibly succeed. I am inclined however to think, that to effect such a revolution would require a very long period. Be these conjectures as they may, it is certain that the revolution has happened, and I believe that it has happened naturally. It is a well-authenticated fact, that the ocean has a constant motion from east to west; which motion, like the trade-winds, is not only perceived between the tropics but through the whole temperate climates, and as near

the poles as navigators have approached. In consequence of this motion, the Pacific Ocean must make continual efforts against the coasts of Tartary, China, and India; the Indian Ocean must act against the east coast of Africa, and the Atlantic must operate in a similar manner upon the eastern coasts of America. Hence the sea has gained, and will always gain on the east, and lose on the west. If such is the natural effect of the motion of the sea from east to west, may we not suppose that Asia, and all the eastern continent, is the most ancient country in the world? and that Europe and part of Africa, particularly the west parts of these continents, as Britain, France, Spain, &c. are more recent countries? Both history and physics concur to establish this hypothesis.

But there are many lands lower than the level of the sea, and defended only by banks, which the action of the waters must gradually destroy, and of consequence the lands must then become part of the ocean. The mountains too are daily diminishing; and every little brook carries earth, and other materials, from the high grounds into the rivers, by which they are at last transported to the ocean. Thus the bottom of the sea is gradually filling up, and the surface of the earth is approaching to a level.

But we shall give a detail of facts, in order to explain the different alterations which the earth has undergone, whether by irruptions of the sea upon the land, or by the sea returning from lands it formerly occupied.

That irruption which gave birth to the Mediterranean is no doubt the greatest. The motion through the straits of Gibraltar is contrary to the motion in every other strait; for the general motion of the sea

is from east to west ; but in the straits of Gibraltar it is from west to east. This circumstance is a clear proof that the Mediterranean Sea is not an ancient gulf, but that it has been formed by an irruption, produced by some accidental cause.

When the ocean forced this passage, it ran through the straits with much more rapidity than it does now, and immediately deluged that large tract of land which formerly joined Europe with Africa. The waters covered all the grounds which were lower than the level of the ocean ; and no part of them is to be seen at present, except the tops of some of the mountains, such as part of Italy, Sicily, Malta, Corsica, Sardinia, Cyprus, Rhodes, and the islands of the Archipelago.

It is not improbable, that the Black Sea will, some time or other, be entirely divided from the Mediterranean ; and that the Bosphorus will be choaked up, whenever the rivers shall have accumulated a quantity of materials sufficient for that purpose.

The Caspian and Black Seas should rather be considered as lakes than as gulfs of the ocean ; because they are perfectly similar to other lakes that receive a number of rivers without any visible outlet, as the Dead Sea, several lakes in Africa, and elsewhere.

But that we may give some recent examples of the changes of sea into land and of land into sea. At Venice the bottom of the sea is constantly rising ; and the same thing may be said of most harbours, bays, and mouths of rivers. In Holland, the bottom of the sea is elevated in many places ; the gulf of Zudovzee and the straits of the Texel, cannot receive such large vessels as formerly ; and it is quite evident that the sea is always dammed up, wherever great rivers empty themselves. The Rhine is lost in the sands which

itself has accumulated. The Danube, the Nile, and all large rivers, after they have transported great quantities of slime, sand, &c. never arrive at the sea by a single channel. Marshes are drained every day; lands, forsaken by the sea, are now ploughed and sown; we navigate whole countries now covered by the waters. In short, we see so many instances of land changed into water, and water into land, as to convince us that, in time, the gulfs of the ocean will become continents, the isthmuses will be changed into straits, and the tops of the mountains converted into shoaly rocks in the sea.

Still, however, those perpendicular fissures, which are equally diffused through rocks, clays, and every constituent material of the globe, remain to be considered. The perpendicular fissures are indeed placed at greater distances from one another than the horizontal; and the softer the matter, the more distant are the fissures. In marble and hard stone, the fissures are only a few feet asunder. If the mass of rock be extensive, the distance between the fissures is some fathoms.

The cause of perpendicular fissures is easy investigated. As various materials constituting the different strata were transported by the waters, and deposited in the form of sediments, they would at first be in a very diluted state, and would by degrees harden and part with the superfluous quantity of water they contained. In the process of drying, they would contract and split at irregular distances. The contraction, therefore, of the parts in drying is the cause of perpendicular fissures; for I have often remarked, that the sides of those fissures, through their whole extent, correspond as exactly as the two sides of a split piece of wood.

Perpendicular fissures vary greatly as to the extent of their openings. It is clear, however, that the fissures, whose openings are small, have been occasioned solely by drying. But those which extend several feet are partly owing to the sinking of the foundation upon one side while that of the other remains firm. When rocks are founded on clay or sand, they sometimes slip a little to a side ; and the fissures are of consequence increased by this motion. I have not taken notice of those prodigious cuts which are found in rocks and mountains, and which could be produced by nothing but the sinking of immense subterraneous caverns that were unable to support the load any longer. But these cuts in mountains are not of the same nature with perpendicular fissures : They appear to have been ports opened by the hand of nature for the communication of nations. This appears to be the intention of all large openings in chains of mountains, and of those straits by which different parts of the ocean are connected ; as the straits of Thermopyle, of Gibraltar, &c. the gaps or ports in Mount Caucasus, the Cordeliers, &c.

These great sinkings, though owing to accidental and secondary causes, are leading facts in the history of the earth, and have contributed much to change the appearance of its surface. Most of them have been produced by subterraneous fires, whose explosions give birth to earthquakes and volcanoes. But though the force of inflamed matter pent up in the bowels of the earth be great, and though its effects appear to be prodigious, we cannot suppose that these subterraneous fires are only branches of an immense abyss of flame in the centre of the earth ; nor do we believe that those fires have their seat at a great depth below the surface, as matter cannot begin to burn, or at least

the inflammation cannot be supported without air. In order to be convinced that the matter emitted by volcanoes does not come from any considerable depth, we have only to attend to the height of the mountain, and to consider the amazing force which would be necessary to project stones and minerals to the height of half a league; for *Ætna*, *Hecla*, and other volcanoes, have at least that elevation.

This, however, is not inconsistent with volcanoes being the cause of considerable earthquakes; nor does it contradict, the communication of one volcano with another, by means of subterraneous passages. For to produce an earthquake in a plain, it is not necessary that the bottom of the volcano should be below the level of that plain, nor that there should be subterraneous cavities filled with the same burning matter under it. A violent explosion may by its reaction produce an earthquake of considerable extent. I would not, however, be thought to say that no earthquakes derive their existence from subterraneous fires; all I mean is, that there are earthquakes produced solely by the explosion of volcanoes.

It is not difficult to account for volcanoes appearing only in mountains; for greater quantities of minerals, sulphur, and pyrites, exist in mountains, and nearer the surface than in the plains. Besides, mountains are more subject to the impressions of the air, and receive more rain and moisture, by which mineral substances are capable of being fermented to such a degree as to produce actual inflammation. And mountains having diminished, nearly in proportion to the quantity of matter thrown out, is another proof that the volcanoes are not so deep as the base of the mountains, and even that they are not much below the summit.

In several places, earthquakes have formed considerable hollows, and even some large gaps in mountains. All other inequalities are coeval with the mountains themselves, and owe their existence to currents in the ocean.

From what has been said, it is easy to perceive how much subterraneous fires have contributed to change both the surface and internal part of the globe. But it is difficult to conceive how any sensible alteration upon the land can be produced by the winds. Their dominion would appear to be confined to the sea ; yet it is well known that the winds raise mountains of sand in Arabia and Africa ; and that they frequently carry these sands many leagues into the sea, where they form banks, downs, and even islands. Every body knows that hurricanes are the scourge of the Antilles, of Madagascar, and of other countries, and that their impetuosity is so violent as to drive back rivers, to overthrow rocks and mountains, to scoup out holes and gulphs in the earth, and totally to change the face of those unhappy countries which they infest.

But the greatest changes upon the surface of the earth are produced by rains, rivers, and torrents from the mountains. These derive their origin from vapours raised by the sun from the surface of the ocean, and which are transported by the winds through every climate. The progress of these vapours is interrupted by the tops of the mountains, where they accumulate into clouds and descend in the form of rain, dew, or snow. By their intrinsic gravity, they run to the bottom of the mountains, and penetrating or dissolving the lower grounds, they sweep along with them sand and gravel, furrow the plains, and thus open passages to the sea, which always gains as much

water by rivers, as it loses by evaporation. The windings in the channels of rivers uniformly have corresponding angles on their opposite banks; and as, mountains and hills, which may be considered as the banks of the vallies by which they are separated, have also sinuosities with corresponding angles, this circumstance seems to demonstrate, that the vallies have gradually been formed by currents of the ocean, in the same manner as the channels of rivers have been produced.

The waters which run upon the surface, compose perhaps not one half of the quantity that is produced by vapour. In almost all the vallies and low grounds at a certain depth, water is uniformly to be found; but in high grounds, it is impossible to extract water from the bowels of the earth. There are extensive countries where no wells can be obtained. In the east, and especially in Arabia, Egypt and Persia, wells and springs are seldom to be met with. To supply their place the inhabitants have been obliged to make large reservoirs to collect the rain water. In plain countries, furnished with large rivers, it is almost impossible to break the surface of the earth without finding water.

The greatest part of the water so liberally diffused through low grounds, comes from the neighbouring hills and eminences. During great rains, or the sudden melting of snow, part of the water runs upon the surface, but most of it penetrates the earth and rocks by small chinks and fissures. It emerges indeed as soon as it can find an opening; but it often creeps along until it can find a bottom of clay, or hard earth and there forms subterraneous lakes, brooks, and perhaps rivers, whose channels are consigned to eternal oblivion.

There are several lakes which neither receive nor give origin to any river. A greater number, however, receive no considerable river, but are the sources of the largest in the world. Such are the lakes from which the river St Laurence arises; the lake Chiame, from which two large rivers proceed, that water the kingdoms of Asem, and Pegu; the lakes of Assiniboil in America; those of Oзера in Muscovy; those too which give rise to the Bog and the Irtis, and many more. It has been affirmed, indeed, that lakes are to be found on the tops of the highest mountains; but those found on the Alps, and other elevated situations, all derive their origin from the waters which run down the sides, or are filtered through the bowels of these superior eminences.

Hence the existence of subterraneous collections of water; for mountains, hills, and heights of every sort, are exposed on every side to the weather. The waters which fall upon any place of an elevated situation, must, after penetrating the earth, from the declivity of the ground, break forth at many places, springs, and fountains; and of consequence little water will be found in the bowels of mountains. But, in plains, as the water filtrated through the earth can find no vent, it must be collected in subterraneous caverns, or dispersed in small veins among sand and gravel. The bottom of a pit or well is only a small artificial bason, into which the water insinuates itself from the higher grounds. Hence it is, that, though water may be found in any part of a plain, only a number of wells can be supplied in proportion to the quantity of water diffused, or rather to the extent of the higher grounds from which it comes.

To find water, it is unnecessary to dig below the level of the river. Even what is found in the earth

below the level of rivers, is not derived from them. Five or six feet of earth is sufficient to contain water, and to prevent its escape.

It would not be easy to make an exact calculation of the quantity of subterraneous waters that have no apparent issue. Many suppose that it is far greater than all that is upon the surface of the earth. But it is probable that the quantity of subterraneous waters which never appear at the surface, is very inconsiderable; for, if the number of subterraneous rivers were so great, why do we never see any of their mouths break out like springs, on the surface. But rivers likewise produce considerable changes on the surface of the earth; they carry off the soil; they wear away the most solid rocks, and sweep off whatever opposes them. The same effects would result from subterraneous rivers. But no such changes have ever been discovered; the different strata every where preserve their parallel and primitive position.

From what we have advanced, we may conclude, that the flux and reflux of the ocean have produced all the mountains, valleys, and other inequalities on the surface of the earth; that currents of the sea have scooped out the valleys elevated the hills, and bestowed on them their corresponding directions; that the waters of the ocean too, by transporting and depositing earth, &c. have given existence to the parallel strata; that the waters from the heavens destroy the effects of the sea, by diminishing the height of the mountains, filling up the vallies, and choking the mouths of the rivers; and, by reducing every thing to its former level, they will restore the earth to the sea, which, by its natural operations, will again create new

continents, beautifully diversified with mountains and vallies, and in every respect like those which we now inhabit.

The surface of this globe is divided, from one pole to the other, into two immense bands of earth, and two of water. The principal of these bands is that which is called the ancient continent, and which includes Europe, Asia, and Africa. This continent, if measured from the two extreme points, that is, from the eastern point of Tartary to the Cape of Good Hope, will produce a line of 3600 leagues; and if measured directly from north to south, we shall find that there are only 2500 leagues from the northern Cape of Lapland to the southernmost point of the Cape of Good Hope. The utmost breadth of this continent, that is from the western coast of Africa to Trefana, as far as Nisingpo, on the east coast of China, is about 2800 leagues.

Another line may be drawn also from Brest in Britany, as far as the coast of Chinese Tartary, will be about 2300 leagues. The old continent, on the best calculations, may be said to contain 4 940,780 square leagues, which is about a fifth part of the surface of the globe, and may be considered as a large belt of earth, with an inclination to the equator of about 30 degrees.

The new continent is called America, and is divided into north and south. Its greatest length may be estimated from the mouth of the river Plata in Paraguay to the lake of the Assiniboils which amounts to about 2500 leagues. It is supposed to contain 2,140,212 square leagues. The whole superficial contents therefore, of both the old and new continents, are about 7,080,993 square leagues, not near a third of the sur-

face of the globe, which contains 25,000,000 square leagues.

Of these lines, which divide both the continents into two equal parts, it is worthy of remark, that they both terminate at the same degrees of north and south latitude; and that the two continents make mutual advances perfectly opposite to one another, to wit, those on the African coast, from the Canary Isles to Guinea; and those of America, from Guiana to the mouth of the Rio-Janeiro.

It therefore appears, that the most ancient lands on the globe, are those which extend from 200 to 250 leagues on each side of the two lines that we have already taken notice of. Agreeable to which idea, we conclude that in the old continent, the most ancient countries of Africa are those which reach from the Cape of Good Hope to the Red Sea and Egypt, and are about 500 leagues broad; and, of consequence, that the whole western coast of Africa, from Guinea to the Straits of Gibraltar, are new lands.

In the new continent we shall likewise find, that Terra Magellanica, the eastern part of Brasil, of the country of the Amazons, of Guiana, and of Canada, are new lands, when compared with Tucuman, Peru, Terra Firma, the islands in the Gulf of Mexico, Florida, the Mississippi, and Mexico.

It was but a small part of the globe with which the ancients were acquainted. All America, the Arctic circle, Terra Australis the Magellanic, and a great part of the internal regions of Africa, were entirely unknown to them. They knew not that the torrid zone was inhabited, although they had navigated around Africa; for it is 2200 years since Neco king of Egypt

gave vessels to the Phœnicians, which departed from the Red Sea, coasted around Africa, doubled the Cape of Good Hope, and having employed two years in this voyage, the third year they entered the straits of Gibraltar*. Nevertheless, the ancients were not acquainted with the property which the load-stone had of turning towards the poles, although they knew that it attracted iron. They were ignorant of the general cause of the flux and reflux of the sea; they were not certain the ocean surrounded the globe without interruption; some indeed suspected it, but with so little foundation, that no one dared to say, or even conjecture it was possible to make a voyage round the world. Magellan was the first who made it A. D. 1519 in 1124 days. Sir Francis Drake was the second, in 1577, and he did it in 1056 days; afterwards Thomas Cavendish made this great voyage in 777 days, in the year 1586. These famous voyagers were the first who demonstrated physically, the globular form and extent of the earth's circumference: for the ancients were far from having a just measure of this circumference, although they had travelled a great deal. The general and regulated winds, and the use to be made of them in long voyages, were also absolutely unknown to them; therefore, we must not be surprised at the little progress they made in Geography, since at present, in spite of all the knowledge we have acquired by the aid of mathematical sciences, and the discovery of navigators, many things remain still to be found, and vast countries to be discovered.

As there is so large a portion of the globe with which we are unacquainted, particularly near the poles, where the ice has never permitted any navigator to penetrate,

* See Herod. Lib. iv.

we cannot exactly know the proportion between the surface of the earth and that of the sea ; only as much as may be judged by inspection of what is known, there is more sea than land.

If we would have an idea of the enormous quantity of water which the sea contains, let us suppose one common and general depth to the ocean ; by computing it only at 200 fathoms, or the 10th part of a mile, we shall see that there is water sufficient to cover the whole globe to the height of 600 feet of water, and if we would reduce this water into one mass, we shall find that it forms a globe of more than 60 miles diameter.

The form of the earth is not that of a perfect globe, but rather what is termed a spheroid, a globe which is flattish at the poles, the axis, therefore, or line, which may be supposed to pass through it at the equator, is to its axis at the poles in the proportion of 230 to 229. The solid parts of the earth are formed of beds or strata of different materials, which lie one upon another in a regular order. The first stratum consists of common soil, mixed with a variety of decayed vegetable and animal substances, and with stony and sandy particles. In different parts of the world the other strata are found to consist of different materials, and differently disposed. In some parts the strata are horizontal, in others they are inclined ; and veins or fissures of metals, coals, and other minerals, frequently penetrate through the different beds or strata to a great depth, and divide them. At Marly-la-Ville in France, which is a high country, but flat and fertile, the following strata were found arranged horizontally. From the shells which were found in N^o 16. we may conjecture, that at some period the soil of Marly-la-Ville was the bottom of the sea, but has since been raised to the height of 75 feet.

The state of the various Beds of Earth found at Marly-la-Ville, at the depth of 101 feet.

	Feet	Inch
I. A free reddish earth, mixed with much mud, a very small quantity of vitrifiable sand, and somewhat more of calcinable sand, - -	13	0
II. A free earth or soil mixed with more gravel, and a little more vitrifiable sand - -	2	6
III. Dirt mixed with vitrifiable sand in a very great quantity, and which made but very little effervescence with aqua fortis - -	3	0
IV. Hard marle, which made a very great effervescence with aqua fortis - - -	2	0
V. Pretty hard marly stone - - -	4	0
VI. Marle in powder mixed with vitrifiable sand	5	0
VII. Very fine vitrifiable sand - -	1	6
VIII. Marle in earth, mixed with a little vitrifiable sand - - - - -	3	6
IX. Hard marle, in which was real flint	3	6
X. Gravel, or powdered marle - -	1	0
XI. Eglantine, a stone of the grain and hardness of marble, and sonorous - -	1	6
XII. Marly gravel - - - -	1	6
XIII. Marble in hard stone, whose grain was very fine - - - - -	1	6
XIV. Marle in stone, whose grain was not so fine - - - - -	1	6
XV. More grained and thicker marle -	2	6
XVI. Very fine vitrifiable sand, mixed with sea fossile shells, which had no adherence with the sand, and whose colours were perfect	1	6
XVII. Very small gravel or fine marle powder - - - - -	2	0
XVIII. Marle in hard stone - -	3	6
Carry over	54	6

	Brought over	Feet	Inch
XIX. Very large powdered marle	-	54	6
XX. Hard and calcinable stone like marble	-	1	6
XXI. Grey and vitrifiable sand mixed with fossile shells, particularly oysters and muscles, which have no adherence with sand, and which are not petrified	- - - -	3	0
XXII. White vitrifiable sand mixed with shells	- - - -	2	0
XXIII. Sand streaked red and white, vitrifi- able and mixed with the like shells	- -	1	0
XXIV. Larger sand, but still vitrifiable and mixed with the like shells	- - -	1	0
XXV. Grey, fine, and vitrifiable sand, mix- ed with the like shells	- - - -	8	6
XXVI. Very fine fat sand, where there were only a few shells	- - - -	3	0
XXVII. Freestone	- - - -	3	0
XXVIII. Vitrifiable sand, streaked red and white	- - - -	4	0
XXIX. White vitrifiable sand	- -	3	6
XXX. Reddish vitrifiable sand	- -	15	0
Total depths when they left off digging		101	6

Within a trench made at Amsterdam, the earth was dry to the depth of 230 feet, and the strata of earth were found as follows: 7 feet of vegetable or garden earth, 9 feet turf, 9 feet soft clay, 8 feet sand, 4 feet earth, 10 feet sand, on which it is customary to fix the piles which support the houses of Amsterdam; then 2 feet argile, 4 of white sand, 5 of dry earth, 1 of soft earth, 14 of gravel, 8 argile, mixed with earth; 4 of gravel mixed with shells; then clay 102 feet thick, and at last 31 feet sand, at which depth they ceased digging.

Every stratum, whether horizontal or inclined, has an equal thickness through its whole extent: that is to say, every bed, of any matter whatsoever, taken separately, has an equal thickness through its whole extent; for example, when the bed of stone in a quarry is three feet thick in one part, it will have the same thickness throughout: if in one part it is found to be six feet thick, it will be so throughout. In the quarries about Paris, the bed of good stone is not thick, and scarcely 18 or 20 feet thick; in other quarries, as those of Burgundy, the stone is much thicker; it is the same with marble; the black and white marble have a thicker bed; the coloured are commonly thinner; and I know beds of very hard stone, which the farmers in Burgundy make use of to cover their houses, that are not above an inch thick. The thickness of different beds, therefore, are different, but each bed preserves the same thickness throughout its extent; in general it may be said, that the thickness of the horizontal strata is so greatly varied, that it is found from one line and less to 1, 10, 20, 30, or 100 feet thick; the ancient and modern quarries which are horizontally dug; the perpendicular, and other divisions of mountains, prove that there are extensive strata in every direction.

The various strata of which the earth is composed, are not disposed according to the order of their specific weight; for we often find strata of heavy matters placed on strata of lighter. To be assured of this, we have only to examine the nature of the earth on which rocks are placed, and we shall find that it is generally clay, which is specifically lighter than the matter of the rock. In hills and other small elevations, we easily discover the base on which rocks are placed; but it is not so with large mountains, not only the summit is rock,

but those rocks are placed on other rocks ; there are mountains upon mountains, and rocks upon rocks, to such a considerable height, and in so great an extent of ground, that we can scarcely be certain where there is earth at bottom, and of what nature it is. We see peaked rocks which are many hundred feet high ; these rocks rest on others, which perhaps are no less so ; nevertheless, may we not compare great with small ? and since the rocks of little mountains, whose bases are to be seen, rest on the earth less heavy and solid than stone, may we not suppose that the base of high mountains is also of earth ?

In a soil where flint is the predominant stone, the country is generally fertile, and if the place is uncultivated, and these stones have been long exposed to the air, without being moved, the upper superficies is always very white, while the opposite side, which touches the earth, preserves its natural colour. If the blackest, and most flinty flint be exposed to the weather, in less than a year its surface will change colour ; and if we have patience to pursue this experiment, we shall see it by degrees lose its hardness, transparency, and other specific characters, and approach every day nearer and nearer the nature of argile.

What happens to flint happens to sand ; each grain of sand may be considered as a small flint, and each flint as a mass of grains of sand, extremely fine and exactly grained. The example of the first degree of decomposition of sand is found in the brilliant and opaque powder salled *Mica*, in which potters earth and slate are always diffused. The entirely transparent flints, the *Quartz*, produce, by decomposition, fat and soft talc, as petrifiable and ductile as clay : and it appears to me that talc is a mediate term between glass or

transparent flint and argile; whilst, on the contrary, coarse and impure flint, by decomposing, passes to potters earth without any intermedium.

Our factious glass proves also the same alterations: it decomposes in the air, and perishes in some degree by remaining in the earth. At first its superficial scales exfoliate; by working it we perceive brilliant scales fly from it; but when its decomposition is more advanced, it crumbles between the fingers, and is reduced into a very fine white talcy powder; and art has even imitated nature in the decomposition of glass and flint.

CHAP. II.

OF HILLS—SEAS—RIVERS—AND LAKES—THEIR NATURE AND PROPERTIES.

IF, in place of that beautiful variety of hills and valleys, of verdant forests, and refreshing streams, which at present delight our senses, the earth were an even and regular plain; a dreary ocean would then cover the whole globe, and it would be merely the habitation of the scaly race.

It cannot therefore be supposed, that even at first the surface of the earth was perfectly regular; and since its first production, a variety of causes, the motion of the waters, the subterraneous fires, the wind, and other external causes, have contributed much to this irregularity.

Next to the elevation of mountains, the depths of the ocean form the greatest irregularities; this depth is very different even at great distances from land;

it is said there are parts above a mile deep, but these are few, and the most general profundities are from 60 to 150 fathoms. The gulphs bordering on the coasts are much shallower, and the straits have generally the least depths.

In general, the depths in open seas increase or diminish pretty regularly, being for the most part deeper the farther from land. But there are places in the middle of the sea, as at the *Abrolkos* in the Atlantic, where large shelves appear; and in other places, there are vast sand banks, to which the East Indiamen are no strangers.

Along coasts, the depths are also very irregular. Yet it may be laid down as a certain rule, that the depth is always proportioned to the height of the coast: the same remark is equally applicable to rivers.

The highest mountains in Asia, are Mount Taurus, Mount Imaus, Caucasus, and the mountains of Japan, all of which are higher than any in Europe: the highest mountains in Africa, *i. e.* the great Atlas, and the mountains of the moon, are at least as high as those in Asia, and the highest of all are in South America, particularly those of Peru, which are more than 3000 fathoms higher than the level of the sea. In general, the mountains between the tropics are loftier than those of the temperate zones, and these more than those of frigid zones, so that the nearer we approach the equator, the greater are the inequalities of the earth: these inequalities, although very inconsiderable with respect to us, are nothing when considered with respect to the terrestrial globe. Three thousand fathoms difference to 3000 leagues diameter, is one fathom to a league, or one foot to 2300 feet, which on a globe of 2 feet and a half diameter, does not make the 6th part of a line.

Hence this earth, which appears to us to be crossed and cut by the enormous height of the mountains, and by the frightful depth of the sea, is, when we consider its size, so very slightly furrowed with irregularities, that they can make no variation upon its general figure.

Upon the continents the mountains are continued, and form chains. In islands they appear to be more interrupted and isolated, and generally raised above the sea, in form of a cone or pyramid, and are called *peaks*. The peak of Teneriffe is one of the highest mountains on the earth ; it is near a mile and a half high perpendicular from the level of the sea ; the peak of St George in one of the Azores, and the peak of Adam in the island of Ceylon, are also exceedingly high. All these peaks are composed of rocks, piled one above another, which emit each from their summits, fire, cinders, bitumen, minerals, and stones. There are even islands which are precisely only as tops of mountains, as the island of St Helena, Ascension, most of the Azores, and Canaries : and we must remark, that in most of the islands, promontories, and other projecting lands in the sea, the middle is always the highest, and they are generally separated by chains of mountains, which divide them in their greatest length ; as the Grampian mountains in Scotland, which extend from east to west, and divide Great Britain into two parts ; it is the same with the islands Sumatra, Lucon, Bornéo, Celebes, Cuba, and St Domingo, and also Italy, which is traversed through its whole length by the Appenines.

With respect to the depths on the surface of the earth, those of the ocean are, no doubt, the greatest, but as these can only be discovered by sounding, we shall take notice of none but such as appear on the dry land. The precipices then which are between rocks, are form-

ed by the sinking of rocks, the base of which sometimes gives way more on one side than the other, by the action of air and frost, which splits and divides them; and by the impetuous fall of torrents, which opens passages, and carries along with them whatever opposes their violence. But these abysses, that is, these vast and enormous precipices found at the summit of mountains, and to the bottom of which it is not possible sometimes to descend, although they are above a mile or half a mile round, have been formed by the operation of fire. They were formerly the funnels of volcanoes, and all the matter which is there deficient has been ejected by the action and explosion of these fires, which are since extinguished for want of combustible matter. The abyss of mount Ararat, of which M. Tournefort gives a description in his voyage to the Levant, is surrounded with black and burnt rocks, as the abysses of *Ætna*, *Vesuvius*, and other volcanoes will be when they have consumed all the combustible matters they include.

Plot, in his natural history of Staffordshire, mentions a kind of gulph, which has been sounded to the depth of 2600 perpendicular feet, without finding either water or bottom.

Great cavities and deep mines are generally in mountains, they never descend to a level with the plains; so we learn from them the internal structure of the mountain only, and not that of the globe.

It was long thought that the chains of the highest mountains run from west to east, till the contrary direction was discovered in the new world; but no person before Mr Bourguet discovered the surprising regularity of the structure of those great masses. After having crossed the Alps thirty times in fourteen dif-

ferent parts, twice over the Appenine mountains, and made divers tours in the environs of these mountains, and in mount Jura, he found that the contours of all mountains bear a striking resemblance to the works of regular fortifications. When the body of the mountain runs from east to west, it forms prominences, which face as much as possible to north and south; this admirable irregularity is so striking in vallies, that we seem to walk in a very regular covered way: if, for example, we travel in a valley from north to south, we perceive that the mountain which is on the right forms projections or angles which front the east, and those of the mountain on the left, front the west; so that, in fact, the prominent and concave angles, on each side, correspond with one another alternately. The angles which mountains form in great vallies are less acute, because the direction is less steep, and as they are farther distant from each other; and in plains they are not so perceptible as in the course of rivers, which generally take up their elbows; the middle of them naturally answer to the most striking projections, or the most advanced angles of mountains; and this is the cause of the serpentine course of rivers. It is astonishing so obvious a fact should have remained so long unobserved, for when in a valley the inclination of one of the mountains which border it, is less steep than that of the other, the river takes its course much nearer the steepest mountain, and does not flow through the middle of the valley.

These observations might be confirmed by a number of facts. The mountains of Switzerland, for instance, are steeper on the south side than on the north, and on the west than on the east side. But the most striking example is afforded by the mountains of

Chili and Peru. The Cordeliers are exceedingly steep on the west side, but they have a gradual declivity towards the east, and they terminate in vast plains, which are terminated by the largest rivers in the world.

This is a consequence of the parallel directions of the different chains of mountains ; and besides the whole continent of Europe and of Asia is broader from east to west, than from north to south ; for there are two modes of conceiving this direction. In the long and narrow continent of South America, there is only one principal chain of mountains, that is, from east to west, or from west to east ; in fact, it is in this direction all the rivers of America flow, because, excepting the Cordeliers, there are no very extensive chains of mountains, and none whose directions are parallel to them. In the old as well as the new continent, most of the waters have their greatest extent from west to east, and most of the rivers flow in this direction, which is owing to another cause, to wit, that there are many long chains of mountains parallel to each other, whose direction is from west to east, and because the rivers and other streams are obliged to follow the intervals which divide these chains of mountains, consequently one single chain of mountains, directed from north to south, will produce rivers, whose direction will be the same as that of those which issued from many chains of mountains, whose common direction is from east to west ; and it is for this particular reason, that the rivers of America have this direction common with those of Europe, Africa, and Asia.

A remarkable phenomenon has been observed with respect to rivers, which is, that in the inland parts at a distance from the sea, they flow in a direct line, but in proportion as they approach their mouths they as-

sume more of a winding course. In large rivers there is a considerable eddy along the banks ; and the nearer the sea this eddy is the greater. The surface of the water in rivers is by no means level from bank to bank ; on the contrary, the middle of the stream is higher or lower than the water of the sides according to circumstances. When a river swells suddenly by the melting of snow or any other cause, the middle of the stream is sensibly higher than the sides : in one instance the elevation is said to have been three feet. On the other hand, when rivers approach their mouths the water near the sides is commonly more elevated than in the middle.

The inundation of the Nile, though nothing can be more natural, has long afforded matter for curious and doubtful speculation. It is the rain which falls in Abyssinia and Ethiopia which occasions the swelling and inundation of this river, though the north wind must be regarded as the primitive cause. 1st, Because it drives the clouds which convey this rain from the coast of Abyssinia : 2dly, Because blowing against the two mouths of the Nile, it forces the waters back against the stream, and thus prevents them from pouring into the sea in too great a quantity : this circumstance may every year be relied on, when the wind being at the north, and suddenly veering to the south, the Nile in one day loses what it gathered in four.

Inundations are generally greatest in the superior parts of rivers ; because the velocity of a river uniformly increases until it empties itself in the ocean. But as the theory of running waters is subject to many difficulties, we ought carefully to study the peculiarities of particular rivers.

The greatest rivers of Europe are, the Wolga, whose course from Reschow to Astracan on the Caspian Sea, is about 650 leagues; the Danube, which runs about 450 leagues, from the mountains of Switzerland to the Black Sea; the Don, from the source of the Sosna, which receives it, to the Black Sea, runs 400 leagues; the Nieper, which also falls into the Black Sea, after running 350 leagues; the Duine, which empties itself in the White Sea, runs a course of about 300 leagues.

The greatest rivers of Asia are, the Hoanho, which rises at Raja Rilron, and which, after running 850 leagues, falls into the middle of the gulf of Changi, in the Chinese Sea; the Jenisca, which runs from Lake Leling to the northern sea of Tartary, a course of about 800 leagues; the Oby, from Lake Kila to the North Sea beyond Waigat's Straits, runs about 600 leagues; the Amour, in East Tartary, has a course of 575 leagues, from the head of the river Kerlon, which falls into it, to the sea of Kamtschatka. The river Menan may be measured from the source of the Longmu, which falls into it, to its mouth at Poulo-condor; the Kian, which runs about 550 leagues, from the source of the Kinxa, which it receives till it discharges itself in the sea of China; the Ganges, which has a course nearly of the same extent with the Kian; the Euphrates, computing from the source of the Irma, which it receives; runs about 500 leagues; the Indus, which runs about 400 leagues, and falls into the Arabian Sea, on the east of Guzarat; and the Sirderoias, which runs about 400 leagues, and falls into Lake Aral.

The greatest rivers of Africa are, the Senegal, the course of which, comprehending the Niger, which is

but a continuation of it, and the source of the Gambarou, which falls into the Niger, is about 1125 leagues; the Nile, which rises in upper Ethiopia, runs about 970 leagues. There are others, the courses of which are but little known, as the Zaira, the Coanza, the Couama, and the Quilmanci, but each of which we are acquainted with to the extent of 400 leagues.

In America, the river of the Amazons runs above 1200 leagues. The course of the river St Lawrence in Canada is more than 900 leagues. The river Mississippi runs above 700 leagues. The Plata extends more than 800 leagues, from its mouth to the source of the Parana, which it receives. The Oronoko runs above 575 leagues, if we reckon from the source of the river Caketa, near Pasto, a part of which falls into the Oronoko, and a part runs towards the river of the Amazons. The Madera which falls into the Amazons extends above 660 leagues.

In order to ascertain the quantity of water discharged into the sea by all the rivers, we shall suppose the one half of the surface of the earth to be sea, and the other half to be dry land. We shall also suppose that the mean depth of the sea is 230 fathoms. The total surface of the earth is 170,981,012 square miles, and that of the sea is 85,490,506 square miles, which, when multiplied by one fourth, the depth of the sea, gives 21,372,626 cubic miles for the quantity of water contained in the whole ocean. Now that we may pretty nearly ascertain the quantity of water discharged into the sea from the rivers, let us take the river Po, for example, which runs through Lombardy, and waters a country 380 miles long. According to Riccioli, the breadth of the Po is 100 feet, and its depth is 10 feet, and it runs at the rate of 4 miles an hour. Con-

sequently, the Po discharges into the sea 200,000 cubical perches of water in an hour ; and as a cubic mile contains 125,000,000 cubic perches, the Po will require 26 days to discharge into the sea a cubic mile of water. It now only remains to determine the proportion that the Po bears to all the other rivers of the earth taken together, which cannot be done exactly. But, to come as near to the truth as possible, let us suppose the quantity of water, which the sea receives from the great rivers in every country, to be proportioned to the extent of the surfaces of those countries ; and, consequently, that the country watered by the Po, and by the rivers that fall into it, is to the total surface of the dry land, as the Po is to all the rivers of the earth. Now, from the most accurate charts, it appears, that the Po waters a country 380 miles long and 120 broad, which makes 45,600 square miles. But the surface of the dry land is 85,490,506 square miles ; consequently, the quantity of water conveyed to the sea by all the rivers, will be 1874 times greater than the quantity discharged by the Po. But, as 26 rivers, equal to the Po, furnish a cubic mile of water every day, it follows, that, in the space of a year, 1874 rivers equal to the Po, will convey to the sea 26,308 cubic miles of water ; and that in 812 years, all these rivers would discharge 21,372,626 cubic miles, which is a quantity equal to what is contained in the ocean ; of course, if the ocean were empty, 812 years would be necessary to fill it from the rivers.

There results from this calculation, that the quantity of water evaporated from the sea, and which the winds convey on the earth, producing rivulets, streams, and rivers, is from 20 to 21 inches in a year, or about two thirds of a line each day ; this is a very trifling eva-

poration when even doubled or trebled, in order to estimate the water which falls back into the sea, and which is not conveyed over the earth. Mr Halley has demonstrated that the vapours which rise above the sea, and which the winds convey over the whole earth are sufficient to form all the rivers, and to contain all the waters which are on the surface of the earth.

In the old continent there are about 430 rivers, which fall directly into the ocean, or into the Mediterranean and Black Seas, and in the new continent, scarcely 180 rivers are known, which fall directly into the sea. In this number, however, I have included none but such as are as large as the river Somme in Picardy. All these rivers carry to the sea a great quantity of mineral and saline parts, which they have washed from the different soils through which they have passed. The particles of salt which are known to be easily dissolved, are conveyed to the sea by the water. Some naturalists, and among the rest Halley, have pretended that the saltiness of the sea proceeded only from the salts of the earth, which the rivers transport thither. Others assert, that the saltiness of the sea is as ancient as the sea itself, and that this salt was created only that it might not corrupt, but it may be well supposed that the sea is preserved from corruption by the agitations of the wind, and the flux and reflux, as much as by the salt it contains; for when it is kept in a barrel, it corrupts in a few days; And Boyle relates that a mariner becalmed for 13 days, found at the end of that time the sea so infected, that if the calm had not ceased, the greatest part of his people on board would have perished. The water of the sea is also mixed with a bituminous oil, which gives it a disagreeable taste, and renders it very unhealthy. The quantity

of salt contained in sea water is about 1-40th part, and the sea is nearly equally saline throughout at top as at the bottom, under the line, and at the Cape of Good Hope, although there are several parts, as on the Mosambique Coast, where it is salter than elsewhere. It is also asserted not to be so saline under the Arctic Zone, which may proceed from the great quantity of snow, and the great rivers which fall into those seas, and because the heat of the sun produces but little evaporation there, in comparison of that produced in hot climates.

There are rivers which lose themselves in the sands, and others which seem to precipitate into the bowels of the earth: the Guadalquiver in Spain, the river of Gottenburgh in Sweden, and the Rhine itself, lose themselves in the earth. It is asserted, that in the west part of St. Domingo, there is a mountain of a considerable height, at the foot of which are several large caverns that receive the rivers and brooks, whose fall is heard seven or eight leagues off. The rivers, however, which disappear in the earth are very few; and they seem not to descend very deep. And it is probable that, like the Rhine, they lose themselves by dividing and disappearing through a large surface of sand, of which there are many examples in Africa, Persia, Arabia, &c.

The rivers of the north carry down to the sea prodigious quantities of ice, which form those enormous masses so dangerous to the mariner. Those in the sea of Nova Zembla and in the straits of Waigat, come from the Oby, and, perhaps, from the Jenisca, and other great rivers in Siberia and Tartary: those of Hudson's straits, from Ascension bay, into which many rivers in North America empty them-

selves ; and those of Terra del Fuego, from the southern continent. If fewer of them are found in the northern coasts of Lapland than in those of Siberia and Waigat's straits, it is because all the Lapland rivers fall into the gulph of Bothnia, and none of them into the North Sea.

The ocean surrounds the whole globe without any interruption of continuity, and the tour of the globe may be made by passing the point of South America, but it is not yet known whether the ocean surrounds the northern part of the globe in like manner ; and all mariners who have attempted to sail from Europe to China by the north-east or north-west, have equally miscarried in their enterprises.

The seas which are called Mediterranean, are properly branches from the great ocean, by which they are supplied. Lakes differ from the Mediterranean seas, because they do not receive any water from the ocean ; for, on the contrary, if they have communication with the seas, they furnish them with water ; thus the Black Sea, which some geographers have regarded as connected with the Mediterranean, and consequently as an appendix of the ocean, is only a lake, because, instead of receiving water from the Mediterranean, it supplies it with some, and flows with rapidity through the Bosphorus into the lake called the sea of Marmora, and thence through the strait of the Dardanelles into the Grecian Sea. The water of the Black Sea is less clear, and much less saline than that of the ocean. No island is to be met with in this sea: tempests are very violent here, and more dangerous than in the ocean ; because the whole body of the waters being contained in a bason, which may be said to have no outlet, they have a kind of whirling motion

when they are agitated, which strikes the vessels on every side with an intolerable violence.

Next to the Black Sea, the greatest lake in the universe is the Caspian Sea, whose extent in length from north to south is about 300 leagues, and scarcely more than fifty broad, computing it in a moderate proportion. This lake receives the Wolga, which is one of the greatest rivers in the world; and also some other considerable rivers, as the Keir, the Fay, and the Gempo; but what is singular is, that it does not receive any on its eastern side throughout this whole length of 300 leagues. There are some small islands in the Caspian Sea, and its waters are much less saline than those of the ocean. In this sea no large vessels are used, as navigation is very dangerous in it, because it is shallow, and many banks and shoals are scattered under the surface of the water.

There are lakes which, like pools, neither receive nor emit rivers. There are others which do receive rivers, and from which others run: and lastly, some which only receive rivers. The Caspian Sea and the lake Aral are of the last kind, they receive the waters of many rivers, and contain them. Thus the Dead Sea receives the Jordan, though no river issues from it. In Asia Minor there is a small lake of the same kind, which receives the waters of a river, the source of which is near Congi, and which, like the preceding, has no other mode than evaporation, to throw off the waters it receives; there is one much larger in Persia, on which the town of Maraga stands, its figure is oval and it is about ten or twelve leagues long, by six or seven broad; it receives the river Taurus, which is not very considerable. There is also a similar small lake in Greece, about 12 or 15 leagues from Lepanto,

and there are some of the same sort both in Africa and America.

The most general and largest lakes, however, are those which, having received another river, or many small rivers, give rise to other great rivers. It is worthy of remark, that all lakes from which rivers derive their origin, all those which fall into the course of rivers, and which carry their water to them, are not saline. But almost all those, on the contrary, which receive rivers, without other rivers issuing from them, are saline, which seems to favour the opinion we have laid down on the subject of the saltiness of the sea, for evaporation cannot carry off fixed salts, and consequently those which rivers carry into the sea remain in it; and although river water appears to taste sweet, we know that it contains a small quantity of salt, and in course of time the sea must have acquired a considerable degree of saltiness, which must still continue to increase. Hence, in my opinion, the Black Sea, the Caspian Sea, the lake Aral, the Dead Sea, &c. are become salt.

The lakes which are any ways remarkable are, the Dead Sea, the waters of which contain much more bitumen than salt; this bitumen, which is called the *Bitumen of India*, is no other than the Asphaltum, which has induced some authors to denominate this sea *Lake Asphaltum*. The land which borders on this lake contains a great quantity of bitumen, and may have applied the fables to this lake, which the poets feign of the lake Avernus, that no fish could live in it, and that birds which attempted to fly over it were suffocated. But neither of these lakes produce such mortal events; fish live in both, birds pass over them, and men bathe in them without the least dan-

ger. A petrifying lake in Iceland, is also mentioned, and the lake Neagh in Ireland, has also the same property of apparently turning wood, &c. into stone ; but these petrifications are no other than incrustations like those made by the water of Arcueil.

CHAP. III.

OF TIDES, OF WINDS, REGULAR AND IRREGULAR—
MONSOONS—HURRICANES—WHIRLWINDS—
WATER-SPOUTS.

WATER, like every other fluid, remains smooth and tranquil, unless put in motion by some foreign cause. All the waters of the ocean are collected in the lowest places upon the surface of the earth ; and hence the motion of the sea must proceed from external causes. The chief motion is that of the tides, which rise and fall alternately, and which produce a perpetual motion from east to west. These two motions have an unvariable relation to the motions of the moon. During the full and new moons, this motion from east to west is most observable, as well as that of the tides, which ebb and flow upon most coasts, every $6\frac{1}{2}$ hours. It is always high tide when the moon arrives at the meridian ; and it is always low tide when the moon is at the greatest distance from it. The motion from east to west is perpetual ; because when the tide rises, it pushes an immense body of water from east to west, and the ebbing seems only to be occasioned by the smaller quantity of water which is then impelled westward.

This motion is attended with the following circumstances: 1st, It is more apparent at the full and new moon than at the quadratures. It is also more violent in spring and autumn than in any other season; and is weakest at the solstices. This is owing to the combined attraction of the sun and moon. 2d, The direction and quantity of this motion is often varied by the winds, particularly by those which blow incessantly from the same quarter. 3d, It is worthy of remark, that when one part of a fluid is moved, the motion is communicated to the whole. During the tides, therefore, a great part of the ocean is put in motion; and the whole ocean, from top to bottom, is agitated at the same time.

In order to throw a little more light upon this subject, let us attend to the causes which produce the tides. We may therefore remark that the moon acts upon the earth by a power called gravity or attraction. This power penetrates the whole globe, and is exactly proportioned to the quantity of matter, and decreases as the squares of the distances increase. Let us now examine what effects this power must produce upon the waters when the moon comes to the meridian of any place. The surface of the water immediately under the moon is therefore nearer that planet than any other part of the earth, consequently that part of the sea must be elevated towards the moon, and the summit of this eminence must be opposite to the moon's centre. To produce this eminence, the waters upon the surface, as well as those at the bottom, contribute their share, in proportion to their distances from the moon, which acts upon them in the inverse ratio of the squares of their distances. Hence the surface of

this part of the sea is first elevated ; the surface of the adjacent parts is also elevated, but not so much ; and the waters at the bottom of all these parts are raised by the same cause. Thus as the whole portion of water under the moon is raised, the waters at a distance, upon which no attraction is exerted, must necessarily rush forward with precipitation to supply the place of those which were drawn towards the moon. It is in this manner that the high tide is produced, which is more or less perceivable in different coasts, and which agitates the sea not only at the surface, but at the greatest depths. The ebb is a consequence of the natural disposition of the water, which when no longer acted upon by the moon, subsides, and returns to occupy those shores from which it had been forced to retire by an external cause.

Nothing is more irregular in our climates than the course of the winds ; but there are countries where this irregularity does not exist, and others where the wind blows constantly in the same direction.

There are several causes which influence the motions of the air, but the most powerful is the heat of the sun, which by rarifying the air produces an influx of the cold air, which is a heavier fluid, and consequently presses in upon that which is rarified and light, and produces a stream or current air. In the torrid zone this effect is more uniformly manifest than in other parts of the world. In the regions near the equinoctial line a continual rarefaction is produced by the sun, and a constant current of air follows that luminary from east to west. This easterly wind blows so generally in the Pacific Ocean, that the ships which sail from Acapulca to the Philippines, perform a voyage of 2700 leagues in less than two months.

About 28 or 30 degrees on this side of the line the west winds are equally constant, and for this reason the vessels returning from the West Indies to Europe do not pursue the same route as in going out.

The winds which blow continually for some months are generally followed by contrary winds, and mariners are obliged to wait for that which is favourable to them ; when these winds change, a calm or dangerous tempest ensues for several days, and sometimes for a month.

These general winds, occasioned by the rarefaction of the atmosphere, combine differently by different causes in different climates. In part of the Atlantic Sea, under the temperate zone, the north wind blows almost constantly during the months of October, November, December, and January, which is the reason why these months are the most favourable to embark from Europe to India, in order to pass the line by the favour of these winds ; and it is known, that ships which quit Europe in the month of March do not arrive sooner at Brazil than those which sail in the month of October. The North wind almost continually reigns during winter in Nova Zembla, and the other northern coasts. The south wind blows during the month of July to Cape Verd, when the rainy season, or winter of these climates sets in : at the Cape of Good Hope the north-west wind blows during the month of September : at Patna, in India, this north-west wind blows during the months of November, December, and January, and produces heavy rains ; but the east wind blows during the other nine months.

In the kingdom of Guzarat, and on the coasts of the neighbouring sea, the north winds blow from March till September ; and during the other months

of the year south winds almost always prevail. The Dutch, in order to return from Java, generally set sail in the month of January or February by an easterly wind, which is felt as far as 18 degrees northern latitude, after which they meet with south winds which carry them to St. Helena.

In the Mediterranean, the winds blow from the land towards the sea at the sun's setting, and, on the contrary, from the sea towards the land at its rising. Hence in the morning it is an easterly wind, and in the evening a westerly wind. The south wind, which is rainy, and which generally blows at Paris, Burgundy, and Champagne, at the beginning of November, and which gives place to mild and temperate breezes, produces the fair weather vulgarly called the summer of St Martin's.

On the sea, the winds are more regular than at land, because the temperature of the sea is more equal than that of the land. For the temperature of the latter is altered by a variety of causes; such as electricity, volcanoes, exhalations from the earth, the explosion of meteors, &c.

In general, on the sea, the east winds and those which come from the poles, are stronger than the west and those which proceed from the equators. On the land, on the contrary, the west and south winds are more or less violent than the east and north winds, according to the situation of the climates.

Contrary currents are often observed in the air; clouds that move in one direction, and others which are higher or lower than the first, proceed in a direction perfectly opposite. This contrariety of motion however does not remain very long, and it is commonly produced only by the resistance of some clouds to

the action of the wind, and by the reaction of the direct wind, which reigns solely as soon as the obstacle is removed.

The winds are more violent in mountainous places than in plains ; and the higher we ascend, the more the power of the wind increases, until we reach the common height of the clouds, which is about one quarter or one third of a league perpendicular height. Beyond that height, the sky is generally serene, especially in summer, and the wind is said to be even imperceptible on the tops of the highest mountains.

A current of air increases in velocity, like a current of water, where the space of its passage is contracted. The wind which is but slightly felt in a wide and open plain, becomes violent in passing through a narrow passage between two mountains, or between two lofty buildings ; and the point of the most violent action of the wind is above the structures or mountain straits. For the air being compressed by the resistance of these obstacles, has a greater mass, density and the same velocity subsisting : the effort or gust of wind, the *momentum* becomes much stronger ; this is the cause that near a church, or a castle, the winds seem to be much stronger than they are at a certain distance from these edifices. I have often remarked, that the wind reflected from a building that stands by itself, is stronger than the direct wind that produced it. And since I have endeavoured to discover the reason of this, I have been able to find no other than the above. The impelled air compresses against the building, and is reflected, not only with its former velocity, but also with a greater body, which, in fact, renders its action much more violent.

Particular winds, whether direct or reflected, are more violent than those which are general. An uniformly continued stream of air produces not such havoc as the fury of those winds which blow in sudden gusts. The predominancy of certain winds, in certain parts, has occasioned a general division of them into zones, though it is not to be understood that their effects are invariable. The east wind, which extends 20 or 30 degrees on each side of the equator, occupies the torrid zone, and the north wind the frigid zones. With regard to the temperate zones, the winds which reign there are, if I may use the expression, only currents of air, whose motion is composed of those two winds whose direction tends to the west. And with respect to the westerly winds, whose direction tends to the east, and which often prevail in the temperate zone, whether in the Pacific or Atlantic oceans, they may be considered as winds reflected by the continents of Asia and America, but originally derived from the east and north winds.

The monsoons, or trade winds, which have an alternate motion, are subject to many deviations. Some continue for a longer, some for a shorter time; and they also differ in their extent, and in their degree of violence. In the Indian ocean, for instance, between Africa and India, as far as the Moluccas, the east wind begins in January, and lasts till June. In the month of August or September, the contrary motion begins; and the west winds reign during three or four months. In the intervals of these monsoons, that is, at the end of June, in the month of July, and beginning of August, there is no wind on that sea; but it is infested with violent storms from the north.

There are winds which may be regarded as peculiar to certain coasts ; for example, the south wind is almost continual on the coasts of Chili and Peru. It begins about the 46th degree of south latitude, and extends beyond Panama, which renders the voyage from Lima to Panama much easier performed than the return. The western winds blow almost continually, or at least very frequently, on the Magellanic coasts, and over the environs of the strait of Maire. The north and north-west winds prevail almost continually on the Malabar coast ; the north-west wind is also very frequent on the coast of Guinea ; and at a certain distance from that coast, in the open sea, we meet with the north-east wind very frequently. The westerly winds reign on the coasts of Japan, in the month of November and December.

The alternate or periodical winds, which we have just been speaking of, are sea winds. But there are also land winds which are periodical, and return either at a certain season, or in certain days, or even at certain hours. On the Malabar coast, for example, from the month of September to April, a land wind blows from the eastern side : it generally commences at midnight and finishes at noon, and is not felt beyond 12 or 15 leagues from the coast, and from noon till midnight a weak sea wind reigns, which comes from the west. On the coast of New Spain in America, and on that of Congo in Africa, land winds reign during the night, and sea winds during the day. At Jamaica the winds blow from all quarters at once during the night, which hinders vessels from either landing or setting out but in the day time.

The winds are however more irregular on the land than on the sea, and more irregular in the higher lands

than in plains. The mountains not only alter the direction of winds, but they even produce winds, which are either constant or variable according to different causes. The melting of the snow, which is upon the mountains, generally produces constant winds, which sometimes remain very long. The vapours which are stopped by mountains, and which accumulate upon them, produce variable winds, very frequent in all climates. In the straits, on all the projecting coasts, at the extremity and in the environs of all promontories, peninsulas, and capes, and in all narrow gulphs, storms are frequent. But independent of these circumstances some seas are much more tempestuous than others. The Indian ocean, the Japan Sea, the Magellanic Sea, that of the African coast beyond the Canaries, and on the other side towards the country of Natolia, the Red Sea, &c. are very subject to storms. The Atlantic ocean is more stormy than the ocean, which from its tranquillity, is called the *Pacific*. This ocean, however, is not absolutely tranquil, except between the tropics, and about the temperate zones; and the more we approach the poles, the more we are subject to variable winds, whose sudden change often occasions tempests.

All continents are subject to variable winds, which often produce singular effects. In the kingdom of Cassimir, which is surrounded by the mountains of Caucasus, a very sudden reverse of seasons is felt on mount Pirepenjale. In less than an hour's journey on it we pass from summer to winter. A north and a south wind, according to Bernier, blow perceptibly within 200 paces of one another. In the peninsula of India, which is traversed from north to south by the mountains of Gate, the extreme heats of summer

are felt on one side of the mountains, and all the rigours of winter on the other. The same phenomenon is also observed at Cape Rozalgate in Arabia, and on the island of Ceylon.

In Egypt during summer, a south wind prevails which is so hot as to stop respiration ; and it raises so great a quantity of sand, that the sky seems covered with thick clouds. This sand is so fine, and driven with such force, that it penetrates every where, even into the closest coffers. When these winds last several days they occasion epidemical diseases, which are often attended with the most fatal consequences.

The Cape of Good Hope is famous for its tempests, and the singular cloud which produces them. This cloud appears at first only like a small round spot in the heavens, called by the sailors *the Ox's eye*, and which I imagine appears so little from its exceeding great height. In Natolia, a cloud similar to the Ox's eye at the Cape, produces the same direful effects. In the sea between Africa and America, especially under the equator and in the neighbouring parts of it, those tempests very often arise ; near the coast of Guinea sometimes three or four of these storms are formed in a day. They are occasioned and announced, like those of the Cape, by small black clouds. The rest of the sky is generally very serene, and the sea calm. The first blast which issues from these clouds is furious, and would sink ships in open seas, if they did not take the precaution to furl the sails. It is principally in the months of April, May, and June, that these tempests are experienced on the Guinea sea, because no regular wind blows there during the season.

All these tempests originate from winds which issue from a cloud, and their direction is either to the north

or south, north-east or south-west, &c. But there are tempests called *hurricanes*, which are still more violent, and in which the winds seem to blow from all the coasts at once, with a circular motion, which nothing can resist. A calm generally precedes these horrible tempests; but in an instant the fury of the winds raises waves as high as the clouds. Some parts of the sea cannot be approached, because they are continually infested with calms or whirlwinds. The Spaniards have therefore called these places *calms and tornados*.

When from a sudden rarefaction, or any other cause, contrary currents of air meet in the same spot, a whirlwind is produced. Perhaps the same effect takes place in another element, and gulphs or whirlpools may be no other than the eddies of the water formed by the action of two or more opposite currents. The Euripus, so famous for the death of Aristotle, alternately absorbs and rejects the water seven times in twenty-four hours. This gulph is near the Grecian coast. The Charybdis, which is near the strait of Sicily, rejects and absorbs the water thrice in twenty-four hours. We are uncertain, however, with respect to the number of alternate motions in other whirlpools. The greatest known gulph is that of the Norway Sea, which is affirmed to be upwards of twenty leagues in circuit. It absorbs for six hours water, whales, ships, and whatever is near it, and afterwards returns them in six hours.

A waterspout is no other than a whirlwind at sea. The vacuum which is occasioned by the meeting currents makes the waters rise up in the form of a cylinder, or rather of an inverted cone. In the travels of Mr Thevenot there is a very minute and circumstantial account of the formation of a waterspout, though there is reason to suspect that the relation is not without some optical deceptions.

“ The first, says this celebrated voyager, that we saw, was on the northern coast, between us and the island Quesomo, about a gun-shot from the ship. We directly perceived water which boiled on the surface of the sea about a foot high ; it was whitish, and appeared above that height like a thick black smoke, so that it properly resembled some burning straw, which only smoked. It made a noise like that of a torrent which runs with much rapidity in a deep valley. But this noise was mixed with another, similar to the strong hissing of serpents or vipers. A little while afterwards we perceived something like a dark canal, or pipe, which bore a strong resemblance to smoke which ascends towards the clouds, revolved with great velocity. This pipe appeared to be about the thickness of my finger, and the same noise continued. The duration of this spout was about a quarter of an hour. We then perceived another on the south side of us, which began in the same manner as the preceding. Immediately a third and then a fourth sprung up, both to the west. Each of them appeared like heaps of smoking straw, and were accompanied with the same noise as the first. We afterwards saw three pipes or canals, which descended from the clouds, on those places where the water was raised up, and each of them was as broad at the end fastened to the cloud, as the broad end of a trumpet, and resembled the teat of an animal, drawn perpendicularly down by a heavy weight. These canals appeared, of a darkish white, and were not straight, but crooked in some places. They even were not perpendicular ; but, on the contrary, from the clouds where they were joined to the parts which drew in the water, they were very much bent. And what is singular is, that the cloud which

the second of these three was fastened to, having been driven by the wind, this canal followed it without breaking or quitting the place where it drew in the water, and passing behind the first canal, they were sometimes crossed like a St Andrew's Cross. At the beginning they were all three about the thickness of my finger, but afterwards the first of the three increased considerably. But the last which was formed scarcely remained longer than that which we saw on the north side. The second on the south side remained about a quarter of an hour, but the first on that side remained a little longer, and it was this which terrified us the most. At first its canal was as thick as my finger, afterwards as thick as my arm, then as my leg, and at last as the trunk of a large tree, which a man might compass with his arms. We distinctly perceived water through this transparent body which ascended in a serpentine form. Sometimes it diminished a little in size, sometimes at top, and sometimes at bottom; then it resembled exactly a soft tube with some fluid matter pressed with the fingers, either upwards, to make this liquor descend, or at bottom, to make it ascend. After this it diminished so much that it was thinner than my arm; afterwards it returned as thick as my thigh, and then became very thin. At last, I saw that the water elevated on the surface of the sea began to lower, and that the end of the canal which touched it divided and grew narrower, when a variation of the light removed it from our view."

CHAP. IV.

OF VOLCANOES—EARTHQUAKES—THE FORMATION
OF NEW ISLANDS—CAVERNS AND GROTTOS—
BOGS AND FENS—CHANGES OF LAND
INTO SEA, &c.

THE burning mountains called volcanoes, include in their bowels sulphur, bitumen, and other materials, which serve as aliment to a subterraneous fire, the effect of which is more violent than that of gunpowder or even of thunder. A volcano is a cannon of a very large size, the orifice of which is often more than half a league. This mouth vomits forth torrents of smoke, flame, rivers of bitumen, sulphur, and melted metal, clouds of cinders and stones, and sometimes it ejects enormous rocks to many leagues distance, which would baffle the utmost efforts of human strength. The combustion is so terrible, and the quantity of burnt, melted, calcined, and vitrified materials which the mountain throws out, is so plentiful, that they enter cities, forests, cover the fields an hundred and two hundred feet in thickness, and form sometimes hills and mountains. The action of this fire is so great, the force of explosion so violent, that its reaction has been known to shake the earth, agitate the sea, overthrow mountains, and destroy the most solid towns and edifices, even to very considerable distances. The natives of Iceland imagine that the roarings of the volcano are the cries of the damned, and its eruptions the effects of the rage and despair of these unhappy wretches.

All these phenomena, however, are only the effects of fire and of smoke. In the bowels of mountains,

there are veins of sulphur, bitumen, and other inflammable substances, and also great quantities of pyrites, which ferment when exposed to the air, or to moisture, and produce explosions in proportion to the quantity of inflammable matter they contain. A mixture of sulphur, of filings of iron, and of water, buried at a certain depth below the ground, will exhibit, in miniature, all the appearances of a volcano. This mixture will soon produce explosions perfectly similar to those of burning mountains.

There are three famous volcanoes in Europe, mount *Ætna* in Sicily, mount *Hecla* in Iceland, and mount *Vesuvius* in Italy, near Naples. Mount *Ætna* has burnt from time immemorial. Its eruptions are very violent, and the matters it throws out are so plentiful that they may be dug to the depth of 68 feet, where we meet with marble pavement, and the vestiges of an ancient town which has been covered and buried under this thickness of matter ejected from the mount, in the same manner as the city of *Herculaneum* has been covered by the matter thrown out from *Vesuvius*. New mouths of fire were formed in 1650, 1669, and at other times. We see the flame and smoke of this volcano from *Malta*, which is about 60 leagues distant from it; it smokes continually, and it sometimes vomits flames and matters of every kind with impetuosity. In 1537, there was an eruption of this volcano, which occasioned an earthquake in Sicily for 12 days, and which overthrew a very great number of houses and structures. It ceased only by the opening of a new fire mouth, which burnt every thing for five miles in the environs of the mountain. The cinders thrown out by the volcano were so abundant, and ejected with so much force, that they were driven as far as Italy; and vessels which

were departed to some distance from Sicily were incommoded by them. Farelli describes the conflagration of this mountain circumstantially, and says the foot of it is 100 leagues in circumference.

This volcano has now two principal mouths, the one narrower than the other. These two vents always smoke, but fire is never seen to issue from them, but during the time of eruptions. It is pretended that stones are found which it has thrown out to the distance of 60,000 feet*.

One of the last and most violent eruptions of mount Vesuvius was in the year 1737. The mountain vomited by divers mouths large torrents of burning metallic matters, which dispersed themselves over the country and into the sea. Mons. de Montealegre, who communicated this relation to the Academy of Sciences, observed with horror one of these rivers of fire, and saw its course for six or seven miles till it reached the sea. Its breadth was sixty or seventy feet, its depth, twenty-five or thirty palms, and in certain bottoms or valleys, 220; the matter which flowed was like the scum which issues from the furnace of a forge.

In Asia as well as in America there are a great number of volcanoes; but there is nothing peculiarly worthy of remark in any, except the violence with which some of them occasionally emit the burning matters with which they are charged.

Near Fez in Africa, there is a mountain, or rather a cavern, called *Beniguazevel*, which always emits smoke, and sometimes flames. One of the islands of Cape Verd, called the island of *Fuogo*, is only a large

* See a most interesting description of this celebrated mountain in an elegant and entertaining production intitled, "Brydon's Tour through Sicily and Moka."

mountain which burns incessantly. This volcano, like the rest, throws out many cinders and stones; and the Portuguese, who have attempted several times to erect habitations in this island, have been constrained to abandon this project, through the dread of the effects of the volcano. The Canaries, the Peak of Teneriffe, and some of the highest mountains in the world, throw out fire, cinders, and large stones; from the top, rivulets of melted sulphur flow, which are distinguishable at a great distance. The matters which volcanoes throw out, generally come forth in the form of a torrent of melted minerals, which inundates all the environs of these mountains. These rivers of liquified matters extend even to considerable distances, and when cooled, form horizontal or inclined strata, which for position are like the strata formed by the sediment left by the waters. But it is very easy to distinguish the strata produced by the expansion of matters thrown out by volcanoes, from those which have the sediment of the sea for their origin. 1. Because these strata are not of an equal thickness: 2. Because they contain only matters which are easily perceived to have been calcined, vitrified, or melted, and because they do not extend to any great distance. When coal mines are opened, which are generally met with in argillaceous earth at a great depth, it sometimes happens that these matters have taken fire. There are even mines of coal in Scotland, Flanders, &c. which have burnt for a number of years. The communication of the air suffices to produce this effect, but the fires which are lighted in these mines, produce only slight explosions, and do not form volcanoes, because all being solid and full in these places, fire cannot be excited, like that of volcanoes, in which there are cavities and void places

where the air penetrates, which must necessarily extend the conflagration and augment the action of the fire, to the point in which we see it when it produces the terrible effects we have taken notice of.

There are two kinds of earthquakes, the one occasioned by the action of subterraneous fires, and the explosion of volcanoes, which are only felt at small distances, and at the time when volcanoes act, or before they open. When the matters which form subterraneous fires, ferment, heat and inflame, the fire makes an effort on every side, and if it does not find a natural vent, it raises the earth and forces a passage for itself by throwing it out, which produces a volcano, whose effects are repeated, and last in proportion to the quantity of inflammable matters. If the quantity of matters which take fire is not considerable, a commotion or an earthquake may ensue, without a volcano being formed. The air produced and rarefied by the subterraneous fire, may also find small vents, by which it will escape, and in this case there will be only a shock without any eruption or volcano. But when the inflamed matter is in a great quantity, and confined by solid and compressed matters, then a commotion and volcano arises: but all these commotions form only the first kind of earthquakes, and can only shake a small space of ground. A very violent eruption of mount *Ætna* will occasion, for example, an earthquake through the whole island of Sicily; but it will never extend to the distance of three or four hundred leagues. When any new mouth is formed in mount *Vesuvius*, there are earthquakes at Naples and in the neighbourhood of the volcano: but these earthquakes have never shook the Alps, and are not communicated to France or to other countries remote from the source of the phenomenon.

But there is another kind of earthquake, very different in its effects, and perhaps in its causes. There are earthquakes too which are felt at great distances, and which shake a long course of ground, without any new volcano or eruption appearing.

To understand rightly what may be the causes of this kind of earthquake, it must be remembered, that all inflammable matters capable of explosion, produce like gun-powder, by inflammation, a great quantity of air; that this air produced by fire is in a state of very great rarefaction; and that, by a state of compression in which it is found in the bowels of the earth, it must produce very violent effects. Let us therefore suppose, that, at a very considerable depth, as at about one or two hundred fathoms, pyrites, and other sulphurous matters are to be met with; and that, by the fermentation produced by the filtration of the water, or other causes, they inflame. At first, these matters are not disposed regularly by horizontal strata, as the more ancient matters are, which have been formed by the sediment of the waters. On the contrary, they are formed in perpendicular strata, in caverns at the foot of these clefts, and in other parts where the water can act and penetrate. These matters inflaming, will produce a great quantity of air or vapour, the spring of which, compressed in a small space, like that of a cavern, will not shake the earth immediately above, but will search for passages, in order to make its escape. It will therefore naturally force its way through those parts where it meets least obstruction, and will therefore proceed through the interstices between the different strata, or through any channel or caverns through which it can find a passage. This subterraneous air or vapour will therefore produce in its passage a noise and motion pro-

portioned to its force and to the resistance it meets with. And these effects will continue till it finds a vent, perhaps in the sea, or till it has diminished its force by being greatly expanded. This explanation corresponds entirely with all the phenomena which are observed respecting earthquakes. They proceed with a wave-like motion, and are felt at different places, not at the same instant, but at different times, in proportion to the distance.

We can also confirm what has been advanced, by connecting it with two other circumstances. It is well known that mines exhale vapours, independent of the wind produced by the current of the water; we often see currents of unhealthy air and suffocating vapours. We also know that there are holes, abysses and deep lakes in the earth, which produce winds, like the lake Boleslaw in Bohemia, &c.

From history we have innumerable instances of the dreadful and various effects of these terrible phenomena. Pliny, in his first book, chap. 84, relates, that in the reign of Tiberius, an earthquake happened, which overthrew twelve towns in Asia; and in his second book he mentions an earthquake which overthrew 100 towns in Lybia. In the time of Trajan, the town of Antiochus, and a great part of the adjacent country, were swallowed up by an earthquake; and in the time of Justinian, in 528, it was again destroyed by a second, with upwards of 40,000 of its inhabitants. And, sixty years after in the time of Saint Gregory, it felt the effects of a third earthquake, with the loss of 60,000 of its inhabitants. In the time of Saladin, in 1182, most of the towns of Syria and Jerusalem were destroyed by the same cause. In Calabria and Pöh, there have been more of them than in any other part of Europe.

In the time of Pope Pius XI. all the churches and Palaces of Naples were overthrown, and above 30,000 of its inhabitants killed. In 1629, there were earthquakes in Pola, which destroyed 7000 persons; and in 1638, the town of Saint Euphemia was swallowed up; and there remains only a stinking lake in its place. Ragusa and Smyrna were also almost destroyed. There was an earthquake in 1692, which extended into England, Holland, Flanders, Germany, and France; it was chiefly felt on the sea coasts and rivers, and extended to a space of at least 2600 leagues square. On the 16th of June, 1628, there was so horrible an earthquake in the island of St Michael, that the sea near it opened, and in one place, where it was more than 150 fathoms deep, threw up an island more than a league and a half long, and upwards of 60 fathoms high.

Another earthquake happened in 1691, which began the 16th of July, and lasted in the island of St Michael till the 12th of the following month. Tercera and Fayal were agitated the next morning with so much violence, that they appeared to move; but these frightful shocks returned only four times; whereas, at St Michaels, they did not cease a moment for 15 hours. The islanders having quitted their houses, which they saw fall before their eyes, passed all that time exposed to the injuries of the weather. A whole town, named Villa Franca, was overthrown to its very foundation, and most of the inhabitants buried under its ruins. Several plains rose into hills: and some mountains became flat. A spring of water issued from the earth, which flowed for four hours, and which appeared dry all on a sudden. The air and sea, still more agitated, resounded with a noise like the roaring of a number of wild beasts. Many persons died with the fright, and

the ships in the ports suffered dangerous shocks ; and those which were at anchor, or under sail, 20 leagues distant from the islands, sustained great damage.

In the year 1646 the mountain of the island of Machian split with terrible reports, by an earthquake ; and so many fires issued through this opening, that they consumed many negro-yards, and all that was in them. This prodigious crack is still apparent ; and it is called the path of Machian, because it descends from the bottom like a road hellowed out, but which at a distance appears like a path.

At sea the shock of an earthquake is felt at a considerable distance. M. Shaw relates, that in 1721, being on board the *Gazelle*, an Algerine vessel, mounting 50 guns, three violent shocks were felt one after the other, as if every time a weight of 20 or 30 tons had been thrown on the ship. This happened in a part of the Mediterranean which was 200 fathoms deep.

In countries subject to earthquakes, it happens, when a new volcano is formed, earthquakes cease, and are only felt in the violent eruptions of the volcano, as is observed in the island of St Christopher.

New islands are produced, either suddenly by the operation of subterraneous fires, or slowly by the accumulated sediments of water. Seneca informs us, that in his time the island of Therasia suddenly emerged from the sea ; and Pliny relates, that thirteen islands arose all at once from the bottom of the Mediterranean. Upon this subject, however, we have some facts more recent, and less involved in obscurity.

The 23d of May, 1707, at sun rising, near this same island of Therasia, or Santorini, something was seen like a floating rock in the sea, Some persons, excited, by curiosity, approached it, and found this shoal,

which had issued from the bottom of the sea, to increase under their feet ; and they brought with them the pumice stone and oysters, which the rock still had attached to its surface. There was a slight earthquake at Santorini two days before the growth of this shoal. This new island increased considerably till the 14th of June, without any accident, and was then half a mile round, and from twenty to thirty feet high. The earth was white, and bordered a little on argillaceous, after which the sea was still more agitated ; vapours arose, which infected the island Santorini ; and, the 16th, 17th, or 18th of July, rocks were seen to issue at one time from the bottom of the sea, all of which seemed to unite into one rock. All this was done with a dismal noise, which continued upwards of two months, with flames that rose from the new island, which still kept itself increasing in circumference and height ; and the explosions always threw out rocks and stones to the distance of seven miles.

The 10th of October, 1720, near the island Tercera, a very considerable fire arose out of the sea. Mariners having been sent to examine it, they perceived, the 19th of the same month, an island which appeared to be covered with fire and smoke, and a prodigious quantity of cinders thrown to a distance, as from a volcano, and accompanied with a noise similar to that of thunder.

The historian of the French Academy in relating this event, remarks, that, after an earthquake in the island of St Michael, a torrent of fire appeared between it and the island Tercera, which gave birth to two new rocks. And next year, the same historian gives the following account :

“ M. de l'Isle has informed the Academy of several
“ particulars, which were communicated to him in a
“ letter, from M. de Montagnac, consul at Lisbon,
“ concerning the new island among the Azores. On
“ the 18th of September 1721, M. de Montagnac's
“ vessel was moored off the Fortress of St Michael,
“ and he procured from the Pilot of the port the fol-
“ lowing intelligence :

“ On the 7th, of December, 1720, at night, a great
“ earthquake happened in Tercera and St Michael, which
“ are distant about 28 leagues from one another, and a
“ new island emerged from the sea. It was, at the same
“ time, observed that the island Peak, thirty leagues
“ distant, which ejected flames, was extinguished. But
“ a continual thick smoke proceeded from the new is-
“ land, which was distinctly perceived by M. de Mon-
“ tagnac, as long as he stopped in that part. The pilot
“ assured him, that he had sailed round the island, and
“ approached it as near as he could with safety. He
“ sounded on the south side of it with a rope of 60
“ fathoms, but found no bottom. On the west side,
“ the water appeared to be mixed with white, blue, and
“ green ; and at the distance of two miles, it seemed
“ to be shallow and boiling. On the north-west, the
“ side from which the smoke issued, he found, at 15
“ fathoms, a bottom of coarse sand. He threw a stone
“ into the sea, and at the place where it fell, he observed the
“ water boil and mount into the air with great velocity.
“ The bottom was so hot as to melt a piece of suet
“ that had been fastened to the end of the plumb line.
“ The pilot also observed smoke to issue from a small
“ lake, in the midst of a sandy plain.

“ We have since learned from M. Adrien, the French
“ consul at St Michael, dated, March 1722, that the

“ new island is near on a level with the water, and
“ that it will probably soon disappear.

“ From these and several other similar facts, it ap-
“ pears, that inflammable bodies exist under the bot-
“ tom of the sea, and that they sometimes produce
“ violent explosions.”

On the whole, however, the islands produced by the action of fire and earthquakes, are but few, and these events are seldom ; but there are an infinite number of new islands produced by the mud, sand, and earth, which the rivers, or the sea carry and transport into different places. At the mouth of all rivers, masses of earth and banks of sand are formed, whose extent often become considerable enough to form islands of a moderate size. The sea retiring from certain coasts, leaves the parts highest from the bottom naked, which form so many new islands. And likewise, by extending itself on certain shores, it covers the lowest parts, and leaves the highest, which it could not surmount, to appear above the surface of the water, which form so many more islands. In consequence of which, it is remarked, that there are very few islands in the middle of the sea, and that they are almost all in the neighbourhood of the continents, where the sea formed them, either by retreating from, or approaching towards, these different countries.

Water and fire, whose natures are different, and even contrary, produce what, at least appears to us to be similar effects. Water, as has been observed, has produced mountains, and formed most islands. There are likewise caverns, clefts, holes, gulphs, &c. some of which owe their origin to subterraneous fires, and others to water.

Saint Patrick's cavern, in Ireland, is not so considerable as it is famous. It is the same with the Dog's Grotto in Italy, and with that which throws out fire in the mountain of Benigauzeval, in the kingdom of Fez.

One of the most remarkable and largest caverns known, is that of Antiparos, which is computed to be three hundred fathoms deep from the surface of the earth; but the grotto appears to be forty fathoms high by fifty broad. It is filled with large, beautiful stalactites, of various forms, both on the roof of the vault and at the bottom.

In that part of Greece, called Livadia, (the Achaia of the ancients) there is a large cavern, in a mountain which was formerly very famous for the oracles of Trophonius, between the lake Livadia and the adjacent sea. There are forty subterranean passages across the rock, under a lofty mountain, through which the waters of the lake continually flow.

In the month of June, 1714, a part of the mountain of Diableret in Valois, fell suddenly, between two and three o'clock in the afternoon. The sky was very serene; the mountain was of a conical figure, and destroyed fifty-three huts belonging to the boors, and crushed to death fifteen people, and above two hundred cattle, and covered a square league with its ruins. A profound darkness was occasioned by the dust. The heaps of stones thrown together stopped the current of the water, which formed new and very deep lakes. In all of which, however, there was not the least trace of bituminous matter, sulphur, lime, nor consequently any subterranean fire, and it appeared that the base of this great rock was worn away, or reduced to dust.

We have a remarkable example of these sinkings near Folkstone, in the county of Kent. The hills in its environs have sunk gradually, by an imperceptible motion, and without any earthquake. These hills internally are rocks of stone and chalk. By this sinking, they have thrown into the sea rocks and earths which are adjacent to it.

When the waters on the surface of the earth cannot find vent to flow, they form morasses and bogs. The most famous morasses in Europe, are those of Muscovy at the source of Tanais; those of Finland, where are the great morasses of Savolax and Enasak. There are also some in Holland, Westphalia, and many other low countries. In Asia, the morasses of the Euphrates, those of Tartary, and the Palus Meotidis; nevertheless, in general there are fewer of them in Asia, and Africa than in Europe. But America may be said to be one continued morass through all its plains. This great number of morasses is a proof of the modern date of the country, and of the small number of inhabitants, and still more of their want of industry.

To give an idea of the quantity of earth which the rain detaches from the mountains and carries along with it into the valleys, we can quote a circumstance related by Dr Plot. In his Natural History of Staffordshire, he observes that eighteen feet deep in the earth several pieces of money coined in the reign of Edward V. have been found; i. e. two hundred years before his time. Hence this ground, which is boggy, has increased above a foot in eleven years, or an inch and a twelfth every year. We can still make a similar observation on trees buried at seventeen feet depth, below which medals of Julius Cæsar have been found. Thus the earth brought from the tops of mountains into plains

by running waters, fail not to increase the elevation of the ground of plains very considerably.

In the city of Modena, and four miles round, whatever part is dug, when we reach the depth of sixty-three feet, and bore five feet deeper with an augur, the water springs out with such force, that the well is filled in a very short space of time. This water flows continually, and neither diminishes nor increases by the rain or drought. What is remarkable in this ground is, that when we reach the depth of fourteen feet, we find pavements, and other ruins of an ancient town, as boards, houses, different pieces of mosaic work, &c. Below these we find a very solid ground, which is thought never to have been stirred; yet below it we find a moist earth mixed with vegetables. And at twenty-six feet, are entire trees, as nut-trees, with nuts on them, and a great quantity of branches and leaves of trees. At twenty-eight feet depth, we meet with a friable chalk, mixed with many shells; and this bed is eleven feet in thickness; after which, we again meet with vegetables, and so on alternately chalk and earth mixed with vegetables, to the depth of sixty-three feet. At which depth is a bed of sand mixed with some gravel and shell, like those formed on the coasts of the Italian sea. These successive beds of fenny or marshy earth and chalk, are always found in the same order, wherever we dig; and very often the augur meets with large trunks of trees, which it bores through, but which give great trouble to the workmen; bones, coals, flint, and pieces of iron are also found. Ramazzini, who relates these circumstances, thinks that the gulf of Venice formerly extended beyond Modena, and that perhaps by the inundations of the sea this ground has been formed.

It is evident, that considerable changes have taken place on the surface of the globe, not only by the action of fire, but also by water. The sea, from various circumstances, has repeatedly changed its bed. Authors have suspected, that the island of Great Britain was formerly united to the continent of France. On the coast of France, England, Holland, and Germany, the sea has retreated in many parts. In Italy, a considerable tract of territory has been gained by the retreating of the ocean; and Ravenna, which was formerly a sea-port of the Exarques, is no longer a maritime town.

On the mountain of Stella, in Portugal, is a lake in which the wrecks of ships have been found, notwithstanding this mountain is more than twelve leagues distant from any sea. Sabinus, in his commentaries on Ovid's *Metamorphoses*, says, that from the monuments of history it appears, that in the year 1460, a whole ship, with its anchors, was found in a mine of the Alps.

CHAP. V.

ANALOGIES BETWEEN ANIMALS AND VEGETABLES—
ON THE NATURE OF MAN—OF INFANCY—MAN-
HOOD—EXTENT OF HUMAN LIFE—OF THE
SENSES—ANECDOTES ILLUSTRATIVE OF
THIS SUBJECT.

AMONG the vast variety of objects in which the surface of this globe abounds, animals hold the first rank, both on account of the relation which they bear to man, and of their superiority over vegetable and

inanimate nature. The senses, the figure, and the motions of animals, afford them a more intimate connection with surrounding objects than vegetables possess. The latter, however, from their expansion, their growth, and the variety of parts which compose them, are more intimately related to external objects than minerals or stones, which are perfectly inert, and destitute of every vital principle. It is this number of relations alone which renders the animal superior to the vegetable, and the vegetable to the mineral.

What a variety of springs, of powers, and of mechanical movements, are included in that small portion of matter of which the body of an animal is composed ! What a number of relations, what harmony, what correspondence among the different parts ! How many combinations, arrangements, causes, effects, and principles, all conspiring to accomplish the same grand design !

But how admirable soever this work may appear, the greatest miracle is not exhibited in the individual. It is in the successive renovation, and in the continued duration of the species, that nature assumes an aspect inconceivable and astonishing. This faculty of reproduction, which is peculiar to animals and vegetables, must, with regard to us, continue to be so profound a mystery, that we shall probably never be able to investigate it with sufficient accuracy.

Even inanimate bodies have some properties, and the most imperfectly organized matter possesses many relations with the other parts of the universe. We will not assert, however, that matter, under whatever form it appears, is conscious of its existence, and of its relative powers. We shall only say, that being ignorant of the extent of our own con-

nections with external objects, we will not hesitate to pronounce inanimated matter to be infinitely more so. Besides, as our sensations have not the most distant resemblance to the causes that produce them, analogy obliges us to conclude that dead matter is neither endowed with sentiment, sensation, nor even with a consciousness of its own existence.

With inanimated matter, therefore, we have no other relations than what arise from the general properties of bodies, extension, impenetrability, gravity, &c. But as relations purely material make no impression on us, and as they exist entirely independent of us, they cannot be considered as any part of our being. Our existence, therefore, is an effect of organization, of life, of the soul. Matter, in this view, is not a principal but an accessory. It is a foreign covering, united to us in a manner unknown. But in order to give a more perfect idea of the nature of man, let us trace him through the different stages of his existence.

At its birth, the infant is exposed to a new element, the air. What the sensations are on the admission of this element into the lungs, it is impossible to conjecture ; but, from the cries of the infant, we have reason to believe that it is attended with pain. The eyes of an infant are indeed open, but they are dull, and appear to be unfitted for the performance of any office whatever ; and the outward coat of them is wrinkled. The same reasoning will apply to most of the other senses. It is not till after forty days that it begins to smile ; nor is it till then that it begins to weep. Its former sensations of pain are unaccompanied with tears. The size of an infant born at the full time, is twenty-one inches, though some do not exceed fourteen ; and it generally weighs twelve, and sometimes fourteen

pounds. The form of the body and members of a new-born infant are by no means perfect. At the end of three days there generally appears a kind of jaundice ; and at that time, there is generally milk in the breast of the infant, which is squeezed out with the fingers. The skull of infants is not completely formed. In the language of the nursery, the head is open in a particular part ; that is, the skull bones have not yet grown far enough to meet. In this opening, a palpitation may sometimes be discovered ; and the beating of the arteries may always be felt. Above this opening, a species of scurf appears, which is rubbed off with a brush. In this country, infants, as soon as born, are injudiciously and unnaturally laced with bandages, which renders them unable to move a single joint. Nations which we call barbarous, act more rationally in this respect. The Siamese, the Indians, the Japanese, the Negroes, the Savages of Canada, of Virginia, of Brasil, and almost all the inhabitants of South America, lay their infants naked in hanging beds of cotton, or in cradles lined with fur.

Infants sleep much, but their sleep is often interrupted. They ought to have the breast every two hours in the day, and in the night as often as they awake. It is of great importance to keep children clean and dry from their excrements. The American Indians, who cannot change their furs as frequently as we can do our clothes, put under them the dust of rotten wood, and renew it as often as it gets damp. Great evils ensue from the negligence of nurses. Infants are sometimes left to cry for a considerable time, which often occasions diseases, or, at least, throws them into a state of lassitude, which deranges their constitutions. To palliate this they are

sometimes put into a cradle and rocked to sleep which may occasionally derange the stomach and head. Before children are put up into the cradle, we ought to be certain they want nothing, and when they are rocked, it ought never to be with such violence as to stun or stupify them. The eyes of children are always directed towards the light, and if one eye only be directed to it, the other will probably become weak; both eyes ought, therefore, to be equally shaded, or equally exposed. Squinting is commonly the effect of injudicious treatment in this respect. For the first two or three months the diet of the infant ought chiefly to be confined to the mother's milk.

The eight incisores, or fore-teeth, appear first. They are produced generally by pairs, and from two months old to ten or twelve. The four canini (or dog-teeth) appear commonly about the 9th or 10th month. About the close of the first, or in the course of the second year, sixteen other teeth appear, called *molaes*, or grinders. In the 5th, 6th, or 7th year, the fore-teeth, and the dog-teeth, and the first six of the grinders, naturally shed, and a new set appears. At the age of puberty, or later, the *dentes sapientiæ*, or wise teeth, appear. Women are said to have fewer teeth than men.

The hair of most infants is exceedingly light, almost white. When a child is suffered to cry violently, and too long, it is in danger of a rupture, but the early application of bandages or trusses will frequently remove the complaint.

The frame of infants is less sensible of cold than during any other season of life. The pulse is strong, and it is therefore fair to conclude, that the internal heat is considerable. Small animals, for the same

reason, have more heat than great ones ; because the action of the heart and arteries increases in proportion to the comparative smallness of the animal. Till the age of three years the life of infants is extremely precarious ; in the course of the ensuing second or third years it becomes more certain, and at six or seven a child has greater probability of living than at any other period of life. It is remarked, that of a certain number of children born at the same time, above a fourth die in the first year ; above a third in two years, and at least one half in three years. By other calculations, it appears that one half of the children born at the same time are not extinct in less than seven or eight years.

At twelve or fifteen months infants begin to lisp. A is the vowel which they pronounce with most ease. Of the consonants, B, M, P, T, are most easy. In every language, therefore, *Baba, Mama, Papa*, are the first words that children learn. Some children pronounce distinctly in two years, though the generality do not speak for two years and a half.

Some young persons cease growing at fourteen or fifteen, while others continue their growth to twenty-two or twenty-three. In men the body attains its perfect proportion at the age of thirty, and in women sooner. The persons indeed of women are generally complete at twenty. The distance between the eyes is less in man than in any other animal ; in some creatures, in fact, the eyes are at so great a distance, that it is impossible they should ever view the same object with both eyes at once. Men and apes are the only animals that have eye-lashes on the lower eyelid. Other animals have them only on the upper one.

The upper eye-lid rises and falls, the lower has scarcely any motion.

The ancients erroneously considered the hair as a kind of excrement, and believed that, like the nails, it increased by the lower part pushing out the extremity. But the moderns have discovered that every hair is a tube, which fills and receives nutriment like the other parts of the body. The roots, they observe, do not turn grey sooner than the extremities, but the whole changes its colour at once. We have known persons the hair of whose heads have become grey in one night.

There is no part of the body which has been subject to such changes of fashion as the hair and the beard. Some people, and among others the Turks, cut the hair off their heads, and let their beards grow. The Europeans, on the contrary, shave their beards, and wear their hair. The negroes shave their heads in figures at one time, in stars at another, in the manner of friars; and still more commonly in alternate stripes; and their little boys are shaved in the same manner. The Talapoins of Siam, shave the heads and the eyebrows of such children as are committed to their care. Every nation seems to have entertained different prejudices, at different times, in favour of one part or another of the beard.

The neck supports the head, and unites it to the body. This part is much more considerable in the greater number of quadrupeds, than in man. But fishes and other animals that have not lungs similar to ours, have no neck whatever. Birds, in general, have the neck longer than any other kind of animal. Those which have short claws, have also short necks; those on the contrary, that have them long, are found to have the neck in proportion.

The human breast is outwardly formed in a very different manner from that of other animals. It is larger in proportion to the size of the body ; and none but man, and such animals as make use of their fore feet as hands, such as monkeys, bats, and squirrels, are found to have those bones called clavicles, or, as we usually term them, collar-bones. The breasts in women are larger than in men ; however, they seem formed in the same manner ; and, sometimes, milk is found in the breasts of men, as well as in those of women. Birds, and all other oviparous animals, have no teats ; but viviparous fishes, as the whale and the dolphin, have both teats and milk.

There is little known exactly with regard to the proportion of the human figure ; and the beauty of the best statues is better conceived by observation than by measurement. Some who have studied after the ancient masters, divide the body into ten times the length of the face, and others into eight. They tell us, that there is a similitude of proportion in different parts of the body : thus, that the hand is the length of the face ; that the thumb is the length of the nose ; that the space between the eyes is the breadth of the eye ; that the breadth of the thickest part of the thigh is double that of the thickest part of the leg, and treble the thinnest, &c.

The strength of man is very considerable when matured by practice. We are assured that the porters of Constantinople carry burthens nine hundred pounds weight. And M. Desaguliers mentions a man in an upright posture, who, by distributing a certain number of weights, in such a manner that every part of his body bore its share, was able to support a weight of two thousand pounds.

The strength of a man may be still farther estimated by the continuance of his labour, and by the agility of his motions. Men, who are exercised in running, outstrip horses, or at least continue their speed for a greater length of time. In a journey, after a man and a horse have proceeded together for several days, the former will be fresh when the latter will be quite tired. The royal messengers of Ispahan run thirty-six leagues in fourteen or fifteen hours. Travellers assure us, that the Hottentots outrun lions in the chace; and that the savages who hunt the elk, pursue this animal, which is as fleet as a stag, with such speed that they take it. The civilized man is ignorant of his own strength, nor is he sensible how much he loses of it by effeminacy, and how he might add to it by the habit of vigorous exercise.

To complete our description of man, it will be proper to investigate the human countenance, as it appears among ourselves, when agitated by the passions. In affliction, in joy, in love, in shame, in compassion, the eyes are apt to be swelled, and as it were obscured by an overflow of tears. The effusion of these is always accompanied with a tension of the muscles of the visage, by which there is occasioned an opening of the mouth. At the same time, the natural moisture in the nose becomes more copious, and, by internal passages, mixes itself with the lachrymal moisture; which, however, flows only at intervals, not always.

The two corners of the mouth are lowered by grief, the under lip is erected, the eye-lid is half closed, the pupil of the eye is raised, and almost covered with the eye-lid. And the other muscles of the face are so much relaxed, that the space betwixt the mouth and the eyes is larger than ordinary, and consequently the countenance assumes a lengthened appearance.

Fear, terror or horror, wrinkles the forehead, raises the eye-brow, extends the eye-lids as much as possible, and discovers a part of the white of the eye over the pupil, which is lowered, and somewhat concealed by the inferior eye-lid. The mouth, at the same time, is widely opened, and the lips being separated, both the upper and under teeth appear.

Contempt or derision raises the upper lip on one side, and on the other there is a little motion, as if in order to smile. The nose is shrivelled on the same side on which the lip is raised, and the corner of the mouth is extended. The eye on the same side is almost shut, while the other is open as usual, but the pupil of each is lowered, as when one looks downward.

By jealousy, malice, and envy, the eye-brow falls down, and is knit, the eye-lid is raised, and the pupil lowered. The under-lip is raised on each side, while the corners of the mouth are rather lowered, and the middle of the under-lip is raised, in order to join the middle of the upper one.

The two corners of the mouth are extended by laughter, and somewhat raised. The upper part of the cheeks is raised, and the eyes are more or less closed. The upper lip too is raised, while the under one is lowered; and, in moderate laughter, the mouth is opened, and the skin of the nose is contracted. Where there is a good natural constitution of the body, it is not impossible, by moderating the passions temperance and sobriety, to extend the period of life for a few years. But even of this there seems to be an uncertainty; for if it is necessary that the body should employ its whole strength, that it should consume whatever it is capable of consuming, that it should undergo every possible ex-

ercise, whence could any benefit accrue from regimen, and from abstinence? Men, no doubt, there are who have outlived the usual period of human existence. Not to mention Parr, who lived to the age of one hundred and fifty-two, and Jenkins, to that of one hundred and sixty-nine, as recorded in the *Philosophical Transactions*; we have many instances of the prolongation of life to one hundred and ten, and even to one hundred and twenty years. Yet this longevity was owing to no peculiar art or management. On the contrary, it appears, that the greater number of such long lives were peasants accustomed to the greatest fatigues, huntsmen, or labourers; men, in fact, who had employed their whole bodily strength, and even abused it, if it be possible to abuse it by any thing but by continual idleness and debauchery.

If in the duration of life there is any difference to be found, it seems proper to ascribe it to the quality of the air. In elevated situations, old people are more generally found than in low ones. In the mountains of Scotland and Wales, Auvergne and Switzerland, there have been more instances of extreme longevity than in the plains of Holland or Flanders, of Germany or Poland. Human life is however nearly the same in every country. Accidental distress excepted, the common verge of existence is ninety or an hundred years, which has been the case since the days of David, without much variation.

The following table of the probabilities of human life has been compiled from a careful examination of many country registers of burials in France, compared with the mortality bills of Paris.

TABLE

OF THE PROBABILITIES OF THE DURATION OF LIFE.

Age.	Duration of Life.		Age.	Duration of Life.		Age.	Duration of Life.	
Years.	Years	Months	Years.	Years	Months	Years.	Years	Months
0	8	0	29	28	6	58	18	3
1	33	0	30	28	0	59	11	8
2	38	0	31	27	6	60	11	1
3	40	0	32	26	11	61	10	6
4	41	0	33	26	3	62	10	0
5	41	6	34	25	7	63	9	6
6	42	0	35	25	0	64	9	0
7	42	3	36	24	5	65	8	6
8	41	6	37	23	10	66	8	0
9	40	10	38	23	3	67	7	6
10	40	2	39	22	8	68	7	0
11	39	6	40	22	1	69	6	7
12	38	9	41	21	6	70	6	2
13	38	1	42	20	11	71	5	8
14	37	5	43	20	4	72	5	4
15	36	9	44	19	9	73	5	0
16	36	0	45	19	3	74	4	9
17	35	4	46	18	9	75	4	6
18	34	8	47	18	2	76	4	3
19	34	0	48	17	8	77	4	1
20	33	5	49	17	2	78	3	11
21	32	11	50	16	7	79	3	9
22	32	4	51	16	0	80	3	7
23	31	10	52	15	6	81	3	5
24	31	3	53	15	0	82	3	3
25	30	9	54	14	6	83	3	2
26	30	2	55	14	0	84	3	1
27	29	7	56	13	5	85	3	0
28	29	0	57	12	10			

By this Table, it appears that we may lay our bett one to one, that an infant newly born will live eight years; that an infant of one year will live thirty-three years longer; that an infant of two years will live thirty-eight years longer; that a man of twenty will live thirty-three years and five months longer; that a man of thirty will live twenty-eight years longer; and so proportionally of every other age.

Ideas of external things are conveyed to the soul of man by means of the five senses, *seeing, hearing, feeling, tasting, and smelling*. The organs by which the senses act are the nerves, which are small thread-like fibres distributed over the whole body, and all of them connected with the brain.

The eyes seem to be formed very early in the human embryo. In the chicken also, of all the parts that are double, they are the soonest produced; and I have observed upon the eggs of several sorts of birds, as well as upon those of lizards, that the eyes were much larger and earlier in their expansion, than any other parts of two-fold growth. Though in viviparous animals, and particularly in man, they are, at first, by no means so large in proportion as in the oviparous classes, yet they obtain their due formation sooner than any other parts of the body. This is also the case with the organ of hearing. The little bones that assist in constructing the internal parts of the ear are entirely formed before any of the other bones have acquired any part of their growth or solidity. Hence it is evident, that the parts of the body which are furnished with the greatest quantity of nerves are those which appear first, and which first attain to perfection.

Mr Chesselden having couched, for a cataract, a lad of thirteen years of age, who had from his birth been blind; and thus communicated to him the sense of seeing, was at great pains to mark the progress of his visual powers. This youth, though hitherto incapable of seeing, was not, however, absolutely and entirely blind. Like every other person, whose vision is obstructed by a cataract, he could distinguish day from night, and even black from white, or either from the vivid colour of scarlet. Of the form of bodies,

however, he could distinguish nothing, nor of colours themselves, unless the light was strong. At first the operation was performed only upon one of his eyes; and when he saw for the first time, he was so far from forming the least conception of distances, that he supposed (as he himself expressed it) every thing he saw touched his eyes, in the same manner as every thing he felt touched his skin. The objects that pleased him most were those of which the surfaces were plain, and the figures regular; though he could neither judge of their different forms, nor give any reason why he preferred some to others. The ideas he had entertained of colours, during his former dark state, were so imperfect, that, when he saw them in reality, he could hardly be persuaded they were the same. When such objects were shewn him as he had been formerly familiar with, by the touch, he beheld them with earnestness, in order to distinguish them a second time. As of these, however, he had too many to retain at once, the greatest number were forgot; and for one thing which he recollected upon seeing a second time, there were a thousand of which he had not the least remembrance. He was very much surprised to find that those persons, and those objects, which he had loved best, were not the most pleasing to the eye. Nor could he help expressing his disappointment in finding his parents less handsome than he had conceived them to be. Before he could distinguish that a picture resembled a solid body, above two months elapsed. Till then, he only considered it as a surface diversified by a variety of colours: but, when he began to perceive that these shadings actually represented human beings, he also began to examine, by the touch, whether they had not the usual qualities.

of such bodies ; and great was his surprise to find what he had imagined a very unequal surface, to be smooth and even. He was then shewn a miniature portrait of his father, which was contained in his mother's watch-case ; and though he readily perceived the resemblance, yet he expressed his astonishment, how so large a face could be comprised in so small a compass. To him it appeared as strange as that a pint vessel should contain a bushel. At first, he could bear but a very small quantity of light, and he saw every object much greater than the life. But in proportion as he observed objects that were really large, he conceived the others to be diminished. Beyond the limits of what he saw, he had no conception of any thing. Although he knew that the apartment he occupied was only a part of the house, he could not conceive how the latter should seem larger than the former. Before the operation he had no great expectation of the pleasure he should receive from the new sense he was promised. That by it he might be enabled to read and write, was his grand object. He said, that he could enjoy no greater satisfaction from walking in the garden, with this sense, than without it ; because there he already walked at his ease, and knew all the walks. With great truth he also observed, that his blindness gave him one advantage over the rest of mankind ; an advantage which indeed he retained long after he had acquired the sense of seeing ; namely, that of being able to walk in the dark with confidence and security. He no sooner, however, had begun to enjoy this new sense, than he was transported beyond measure ; and he declared that every new object opened to him a fresh source of delight. About a year after, he was carried to Epsom, where there is a beautiful,

and an extensive prospect. With this he seemed greatly charmed; and the landscape before him he called a new method of seeing. He was couched in the other eye, a year after, and of both operations the success was equal. When he saw with both eyes every thing appeared to him twice as big as when he saw but with one, although he did not see double, or at least he discovered no marks from which any such conclusion could be inferred.

Distance is only conceived by experience, for the more distant an object is, the less it appears. When, from certain circumstances, we cannot form a just conception of distance, and when we cannot judge of objects but by the angle, or rather by the image, which they have in our eyes, we are then necessarily deceived as to their size. Every man has felt how liable we are in travelling by night to mistake a bush which is near for a tree at a distance, or indeed a distant tree for a bush at hand. In the same manner if we do not distinguish objects by their shape, and if we cannot by it judge of distance, the same fallacy will still continue. In this case, a fly, which may pass before us with rapidity, will seem to be a bird at a considerable distance; and a horse which may be in the middle of a plain, not moving, and in an attitude similar, for instance, to that of a sheep, will seem to be no bigger than a sheep, till we have found out that it is a horse.

If, therefore, we are benighted in a strange place, where no judgment can be formed of distance, we are every moment liable to deceptions of vision. Hence originate the dreadful stories of spectres, and of those wonderful, hideous, and gigantic figures, which so many persons speak of having seen. Though such figures, it is commonly asserted, exist solely in the ima-

gination, yet it is highly probable that they might appear to the eye, in every different respect described to us. This remark will be allowed to be more probable, when we consider, that whenever we cannot judge of an object but by the angle which it forms in the eye, this object is magnified according to its propinquity. And that, if it seemed at first to the spectator, who is equally incapable of distinguishing what he sees, and of judging at what distance he sees it, when at the distance of twenty or thirty paces from it, a few feet high, it must look to him, when within a few feet of it, of a size stupendously increased. At this he must naturally be terrified, till he touches and distinguishes the seemingly gigantic object, for, in the very instant that he has an actual perception of what it is, the object will diminish, and appear to him what it really is. If, on the other hand, he is afraid to approach it, and he flies from the spot with precipitation, the only idea he will form of what had presented itself to him, will be that of an image, gigantic in its size, and dreadful in its form. This prejudice about spectres, therefore, originates from nature ; and such visions depend not, as philosophers have supposed, upon the imagination only.

We have several reasons for supposing that such persons as are short-sighted see objects larger than others ; and yet it is a certain fact that they see them less.

Deception is not, however, confined to one sense ; so that hearing is liable to similar mistakes with sight. By this sense no distinct intelligence is conveyed of the distance whence a sounding body is heard. A great noise, if distant, and a small one, very near, produce the same feeling ; and unless we receive information

from some other sense, we can never tell accurately whether the sound be great or small. It is not till we have by experience become acquainted with any particular sound, that we can judge of the distance whence we hear it. When, for example, we know the tone of a bell, we are then at no great loss to determine how far it is from us.

Every body that strikes against another produces a sound, which is simple in such bodies as are not elastic, but which is often repeated in such as are. If we strike a bell, for instance, a single blow produces a sound, which is repeated by the undulations of the sonorous body, and which is multiplied as often as it happens to undulate or vibrate. These undulations succeed each other so fast, that the ear supposes them one continued sound ; whereas they form many sounds. Sounding bodies are therefore of two kinds, to wit, non-elastic and elastic. The former when struck return but a single sound, and the latter return a succession of sounds, which form a tone. This tone may be considered as a great number of sounds, all produced one after the other, by the same body, as we find in a bell which continues to sound for some time after it is struck. A continuing tone may also be produced from a non-elastic body, by repeating the blow quick and often, as when we beat a drum, or when we draw a bow along the string of a fiddle.

To know the manner in which musical sounds become pleasing, it must be observed, no one continuing tone, how loud or swelling soever, can afford us delight. We must have a succession of them, and those in the most pleasing proportion. The nature of this proportion may be thus conceived. If we strike a body incapable of vibration with a double

force, or, what amounts to the same thing, with a double mass of matter, it will produce a sound that will be double grave. Music has been said, by the ancients, to have been first invented from the blows of different hammers on an anvil. Suppose then we strike an anvil with a hammer of one pound weight, and again with a hammer of two pounds, it is plain that the two pound hammer will produce a sound twice as grave as the former. But if we strike with a two pound hammer, and then with a three pound, it is evident that the latter will produce a sound one third more grave than the former. If we strike the anvil with a three pound hammer, and then with a four pound, it will likewise follow that the latter will be a quarter part more grave than the former. Now, in comparing between all those sounds, it is obvious that the difference between one and two is more easily perceived than that between two and three, three and four, or any number succeeding in the same proportion. The succession of sounds will therefore please in proportion to the ease with which they may be distinguished. That sound which is double the former, or, the octave to the preceding tone, will be the most pleasing. The next to that, which is as two or three, or, the third, will be most agreeable. And thus universally, those sounds whose differences may be most easily compared are the most agreeable.

Sound has in common with light, the property of being extensively diffused. Like light, it also admits reflection. The laws of this reflection, it is true, are less distinctly understood than those of light. All we know is, that sound is principally reflected by hard bodies, and that their being hollow also sometimes increases the reverberation. The internal cavity

of the ear, which is fashioned out in the temporal bone, like a cavern cut into a rock, seems to be fitted for the purposes of echoing sound with the greatest precision.

One of the most common complaints in old age is deafness; which probably proceeds from the rigidity of the nerves in the labyrinth of the ear. This disorder also proceeds sometimes from a stoppage of the wax, which art may easily remedy. In order to know whether the defect be an internal or an external one, let the deaf person put a repeating-watch into his mouth; and if he hears it strike, he may be assured that his disorder proceeds from an external cause.

It often happens, that people hear better with the one ear than with the other; but these have, what musicians call, a bad ear. I have made several experiments on persons of this description; and I have uniformly found, that their defect in judging properly of sounds proceeds from the inequality of their ears, and from their receiving by both at the same time, unequal sensations. In like manner, as such persons hear false, they also, without knowing it, sing false. They also frequently deceive themselves with regard to the side whence the sound comes, generally supposing the noise to come on the part of the best ear.

Hearing is a much more necessary sense to man than to animals. In these it is only a warning against danger, or an encouragement to mutual assistance. In man, it is the source of most of his pleasures; and without it the rest of his senses would be of little benefit. A man born deaf, must necessarily be dumb; and his whole sphere of knowledge must be bounded by sensual objects. We have a singular instance of a young man, who, being born deaf, was restored, at the age

of twenty-four, to perfect hearing. The account which is given in the memoirs of the Academy of Sciences, 1703, page 18, is as follows :

“ A young man, of the town of Chartres, between the age of twenty-three and twenty-four, the son of a tradesman, and deaf and dumb from his birth, began to speak all of a sudden, to the utter astonishment of the whole town. He gave them to understand that, about three or four months before, he had heard the sound of the bells, and was greatly surprised at this new and unknown sensation. After some time, a kind of humour issued from his left ear, and he then heard perfectly well with both. During these three months he listened to every thing ; and without attempting to speak aloud he accustomed himself to utter softly the words spoken by others. He laboured hard also in acquiring the pronunciation of words, and in learning the ideas of which they are expressive. At length, having supposed himself qualified to break silence, he declared, that he could now speak, though as yet but imperfectly. Soon after, some able divine questioned him concerning his ideas of his past state ; and principally with respect to God, his soul, the moral beauty of virtue, and deformity of vice. The young man, however, had not directed his solitary speculations into that channel. He had gone to mass indeed with his parents, had learned to sign himself with the cross to kneel down, and to assume all the grimaces of a man in the act of devotion. But he did all this without any manner of knowledge of the intention or the cause ; he saw others do the like, and that was enough for him. He had formed no idea of death ; but he led a life of pure animal instinct ; and though entirely taken up with sensible objects, and such as

were present, he yet did not seem to have made such reflections even upon these, as might reasonably have been expected. The young man was not, however, deficient in understanding; but the understanding of a man, deprived of all commerce with others, is so very confined, that the mind may be said to be under the control of its immediate sensations.

“ It is highly possible, nevertheless, to communicate ideas to deaf men, which they previously wanted, and even to give them very precise notions of abstract and general subjects, by means of signs and of letters. A person born deaf may, by time and application, be taught to read, to write, and even by the motions of the lips to understand what is said to him. This is a plain proof how much the senses resemble, and may supply the defects of each other. It is probable, however, that as most of the motions of speech are made within the mouth by the tongue, the knowledge from the motion of the lips can be but very confined.

The sense of feeling is spread over the whole body, but it employs itself differently in different parts. The sensation which results from feeling, cannot be excited otherwise than by the contact and immediate application of the superficies of some foreign body to that of our own. If we apply a foreign body against the breast, or upon the shoulder of a man, he will feel it; that is, he will know that there is a foreign body which touches him. But he will not have a single idea of the form of this body, because the breast touching the body in a single plain, or surface, he cannot gather from it any knowledge of this body. It is the same with respect to all other parts of the body, which cannot adjust themselves upon the surface of foreign bodies, and bend themselves, to embrace at one time,

many parts of their superficies. These parts of our body cannot, therefore, give any just idea of their form; but those on the contrary, which, like the hand, are divided into small flexible and moveable parts, and which, consequently, can apply themselves at one and the same time, upon the different plains of the superficies of the body, are those, which, in effect, give us the ideas of their form, and of their size.

It is not, therefore, only because there is a greater quantity of nervous tufts at the extremity of the fingers than in any other part of the body. It is not, as it is vulgarly pretended, because the hand has the most delicate sense, that it is in effect the principal organ of feeling. On the contrary, we can say that there are parts more sensible, and where the sense of feeling is more delicate, as the eyes, the tongue, &c. But it is merely because the hand is divided into many parts, all moveable, all flexible, all acting at the same time, and all obedient to the will; it is, because it is the only organ which gives us distinct ideas of the form of bodies. Animals which have hands, appear to be the most acute. Apes do things so like the mechanical actions of man, that it seems as if they had the same succession of corporeal sensation for the cause of them. Animals, which are deprived of this organ, as they cannot grasp any object, and as they have not any part divided and flexible enough to be able to adjust itself upon the superficies of bodies, they certainly have not any precise notion of the form, or of the size of them. It is for this reason that we often see them in suspense, or frightened at the aspect of objects which are the most familiar to them. The principal organ of their feeling is the muzzle, as this part is divided in two by the mouth, and as the tongue

is another part, that serves them at the same time to touch bodies, which we see them turn and turn again before they take them between their teeth.

It is therefore to the sense of feeling that we are indebted for the power of usefully exercising all other faculties. One man does not, perhaps, possess more ingenuity or capacity than another; but because in his earliest infancy he made a greater, and a readier use of this sense. As soon as children are indulged with the liberty of their hands they presently bring them into action, and are fond of touching whatever is presented to them. They are seen to amuse themselves, and to take a pleasure in handling every thing they are capable of grasping. They seem as if they were endeavouring to find out the form of bodies, by touching them on every side; and for a considerable time, they amuse themselves in this manner, or rather they inform themselves of new objects.

CHAP. VI.

OF THE APPARENT VARIETIES IN THE HUMAN SPECIES—LAPLANDERS—TARTARS—CHINESE—JAPANESE—FORMOSANS—MOGULS—PERSIANS—ARABIANS—CIRCASSIANS—TURKS—RUSSIANS—NEGROES—HOTTENTOTS—AMERICANS—CAUSES OF THIS VARIETY.

THERE are many causes which contribute to produce an apparent variety between the different nations of the globe. Climate, food, manners and customs, produce not only a difference in sentiment, but even in the external form of different people.

In examining the surface of the earth, and beginning our inquiries from the north, we find in Lapland, and in the northern parts of Tartary, a race of small-sized men, whose figure is uncouth, and whose physiognomy is as wild as their manners are unpolished. Though they seem to be of a degenerate species, they are very numerous, and occupy vast regions.

The Laplanders, the Danes, the Swedes, the Muscovites, the inhabitants of Nova Zembla, the Borandians, the Samoeids, the Ostiacs of the old continent, the Greenlanders, and the savages to the north of the Esquimaux Indians of the new continent, appear to be of one common race, which has been extended and multiplied along the coasts of the northern seas, and over deserts, considered as uninhabitable by every other nation. In these countries, the visage is large and broad, the nose is flat and short, the eyes are of a yellowish brown, inclining to black, the eye-lids are drawn towards the temples, the cheek-bones are extremely prominent, the mouth is very big, the lower part of the countenance is very narrow, the lips are thick and turned outward, the voice is shrill, the head is bulky. The hair is black and straight, and the skin is tawny. They are small in stature, and, though meagre, they are of a squat form. In general, their size is about four feet, nor do the tallest exceed four and a half; and among these people, if there is any difference to be found, it depends on the greater or less degree of deformity.

The Danish Laplanders have a large black cat, which they make a confidant of all their secrets, and a counsellor in all their difficulties. Among the Swedish Laplanders, there is in every family a drum, for the purpose of consulting the devil: and notwithstanding the natives of these countries are robust and nimble, from

many circumstances there is reason to suppose, that they cannot live but in their own country, and in their own manner. In travelling over the ice and snow, they use skates made of fir, which are about two feet long, and about half a foot broad, which are raised and pointed before, and fastened to the foot by straps of leather. With these they make such dispatch, that they easily overtake the swiftest animals. They also use a pole, pointed with iron at one end, and rounded at the other. This pole serves to push them along, to direct their course, to keep them from falling, to stop the impetuosity of their career, and to kill what game they overtake. With their skates they descend the steepest mountains, and scale the most craggy precipices ; nor are the women less skilful in such exercises than the men. They are all accustomed to the bow and arrow ; and it is asserted, that the Muscovite Laplanders lance a javelin with so much dexterity, that at the distance of thirty paces, they are sure to hit a mark no larger than a silver crown, and with such force, that it will transfix a human body. As huntsmen, their favourite pursuit is that of the ermine, the fox, the lynx, and the martin ; and of these animals, they barter the skins for their favourite articles of luxury, brandy and tobacco.

In winter, the Laplanders clothe themselves with the skin of the rein-deer, and in summer with the skins of birds. To the use of linen they are perfect strangers. The women of Nova-Zembla have their nose and their ears pierced, in order to have them ornamented with pendants of blue stone ; and also, as an additional lustre to their charms, they form blue streaks upon their forehead and chin. Those of Greenland dress themselves with the skin of the dog-fish. They also paint the visage with blue and yellow co-

lours, and wear pendants at their ears. They all live under ground, or in huts almost entirely covered with earth, and with the bark of certain trees, or the skin of certain fishes. Some even form subterranean trenches, by which one hut communicates with another, and by which, during the winter months, they enjoy the conversation and society of their neighbours. A continued series of darkness for several months, obliges them to illuminate their dreary abodes with lamps, which they keep alive with that very train-oil they use as drink. Under all these hardships, they are subject to few diseases, and they live to a prodigious age. So vigorous indeed are the old men, that they are hardly to be distinguished from the young. The only infirmity they experience, and it is an infirmity common to them all, is blindness. Dazzled by the strong reflection of the snow, in winter, and enveloped in clouds of smoke in autumn and spring, when advanced in years, they seldom retain the use of their eyes.

The Tartar country, taken in general, comprehends the greatest part of Asia, and extends even from Russia to Kamtschatka. It is from eleven to twelve hundred leagues long, and about seven hundred broad, of course its circumference is twenty times larger than that of the whole kingdom of France.

All the Tartar nations have the upper part of the visage very large and wrinkled, even in their youth. Their nose is short and flat, their eyes are little and sunk in the head; their cheek bones are high; the lower part of their visage is narrow; their chin is long and prominent; their teeth are long and straggling; their eye-brows are so large as to cover the eyes; their eye-lids are thick; the face is broad and flat;

their complexion is tawny, and their hair is black. They have but little beard, have thick thighs, and short legs, and, though but of middling stature, they are remarkably strong and robust. The ugliest of them are the Calmouks, in whose appearance there seems to be something frightful. They are all wanderers and vagabonds; and their only shelter is that of a tent made of hair or skins. Their food is horse-flesh and camel-flesh, either raw, or a little sodden between the horse and the saddle. They eat also fish dried in the sun. Their most common drink is mare's milk, fermented with millet ground into meal. They all have the head shaved, except a tuft of hair on the top, which they let grow sufficiently long to form into tresses on each side of the face. The women who are as deformed as the men, wear their hair, which they bind up with bits of copper, and other ornaments of the same nature.

The majority of these tribes are strangers to religion, morality, and decency. They are robbers by profession; and the natives of Daghestan, who live in the neighbourhood of more polished countries, carry on a great traffic of slaves, whom they carry off by force, and afterwards sell to the Turks and the Persians. Their wealth consists chiefly of horses, which are more numerous, perhaps, in Tartary, than in any other part of the world. They are taught, by custom, to live in the same place with their horses. They are continually employed in training and exercising them; and at length they reduce them to such implicit obedience, that they actually appear to understand the intention of the rider.

The limbs of the Chinese are well-proportioned, their bodies are large and fat, their visages are large

and round. Their eyes are small, their eye-brows are large, their eye-lids are turned upwards, and their noses are short and flat. Their beards are black, upon their chins there is very little hair, and upon each lip there are not more than seven or eight prickles. Those who inhabit the southern provinces of the empire, are more brown and tawny than the others. In colour, they resemble the natives of Mauritania, and the more swarthy Spaniards; but those who inhabit the middle provinces are as fair as the Germans.

Le Gentel assures us, that the Chinese women do every thing in their power to make their eyes appear little, and oblong. For this purpose, it is a constant practice with the little girls, from the instruction of the mother, forcibly to extend their eye-lids; and with the addition of a nose thoroughly compressed and flattened, of ears long, large, open, and pendant, they are accounted complete beauties. He adds, that their complexion is delicate, their lips are of a fine vermilion, their mouth is well-proportioned, their hair is very black; but that, by the use of paint, they so greatly injure their skin, that, before the age of thirty, they have every appearance of old age.

So strongly do the Japanese resemble the Chinese, that we can hardly scruple to rank them in the same class. As being inhabitants of a more southern climate, they only differ from them in being more yellow or more brown. In general, their stature is small, their face, as well as their nose, is broad and flat, their hair is black, and their beard is little more than perceptible. They are haughty, fond of war, full of dexterity and vigour, civil and obliging, smooth-tongued, and courteous, but fickle and vain. With astonishing patience, they sustain hunger, thirst, cold, heat, fa-

ti-
gigue, and all the other hardships of life. Their ceremonies, or rather grimaces, in eating, are numerous and uncouth. They are laborious, are very skilful artificers, and, in a word, have nearly the same disposition, the same manners, and the same customs, as the Chinese.

One custom which they have in common, and which is not a little fantastic, is, so to contract the feet of the women, that they are hardly able to support themselves. Some travellers mention, that in China, when a girl has passed her third year, they break the foot in such a manner, that the toes are made to come under the sole ; that they apply to it a strong water, which burns away the flesh ; and that they wrap it up in a number of bandages, till it has assumed a certain fold. They add, that the women feel the pain of this operation all their lives ; that they walk with great difficulty ; and that their gait is to the last degree ungraceful. Other travellers do not say that they break the foot in their infancy, but they only compress it with so much violence as to prevent its growth ; but they unanimously allow, that every woman of condition, and even every handsome woman must have a foot small enough to enter, with ease, the slipper of a child of six years old.

Though the inhabitants of the kingdoms of Pegu and Aracan are blacker, yet they bear all a considerable resemblance to the Chinese. Those of Aracan put great value upon a forehead large and flat ; and, in order to render it so, they apply a plate of lead to the forehead of their children as soon as they are born. Their nostrils are large and extended ; their eyes are small and lively ; and their ears are of such length as to hang over their shoulders. They feast with a

relish on mice, on rats, on serpents, and on fish, however it may stink. Their women are tolerably fair, and their ears are as long as those of the men. The people of Achan, who are situated farther to the north than those of Aracan, have also a flat visage, and an olive-coloured skin. They allow their boys to go quite naked, and their girls with only a slight plate of silver over those parts which nature dictates to conceal.

Northward of the Phillippine Islands is situated the island Formosa, of which the natives, though at no great distance from the coast of Fokian in China, bear not the least resemblance to the Chinese. According to Struys, the Formosans are of a small stature, particularly those who inhabit the mountains, and their visage is broad. The women have large and full breasts, and a beard like the men. Their ears are naturally long, and they render them still more so by certain thick shells, which they wear as pendants. Their hair is very black, and very long, and their complexion is yellowish. These Islanders, though averse to labour, are yet admirably skilled in the use of the javelin and bow. They are also excellent swimmers; and when they run, their swiftness is incredible.

The Moguls, and the other inhabitants of the peninsula of India, are not unlike the Europeans in shape and in features; but they differ more or less from them in colour. The Moguls are of an olive complexion; and yet, in the Indian language, the word Mogul signifies White. The women are extremely delicate, and they bathe very often. They are of an olive colour, as well as the men; and, contrary to what is seen among the women of Europe, their legs and thighs are long, and their body is short. Tavernier says, that,

after passing Lapor, and the kingdom of Cashmire, the women have no hair on any part of the body, and the men have hardly any beard. According to Thevenot, the Mogul women are tolerably fruitful, though exceedingly chaste. They likewise suffer little from the pains of child-birth, and are often known to be abroad the day following. He adds, that in the kingdom of Decan they are allowed to marry, the husband by his tenth, and the wife by her eighth year; and at that age they very often have children. The women who become mothers so soon, usually cease bearing, however, before they arrive at thirty; and by that period, they appear wrinkled, and marked with all the deformities of age.

The customs of the different nations of India are all very singular, if not whimsical. The Banians eat nothing which has life in it; and they are even afraid to kill the smallest reptile, however offensive to them. They throw rice and beans into their rivers as food for the fishes, and grain of different kinds upon the earth for the birds and insects. When they meet with a huntsman, or a fisher, they beg of him instantly to desist from his employment. If he remain deaf to their intreaties, they offer him money for his gun, or his nets; and when no persuasion, no offer, will avail, they trouble the water, in order to frighten the fishes, and cry with all their might, to put the birds and other game to flight.

In Ceylon there is a species of savages, denominated *Bedas*, who occupy a small district on the north part of the island, and seem to be totally different from all the nations around them. The spot they inhabit is entirely covered with wood, amidst which they keep themselves so closely concealed, that it is with great

difficulty they are discovered. Their complexion is fair, and sometimes even red, like that of the Europeans. They do not speak the language of Ceylon ; nor indeed has their language the least affinity to that of any of the other Indians. They have no villages, no houses, no intercourse with the rest of mankind. Their arms are, the bow and the arrow, with which they destroy a number of boars, stags, and other animals ; and though they never dress their meat, they sweeten it with honey, which they possess in great abundance.

The inhabitants of Persia, of Turkey, of Arabia, of Egypt and of the whole of Barbary, may be considered as one and the same people, who, in the time of Mahomet, and of his successors, invaded immense territories, extended their dominions, and incorporated with the original natives of all those countries. The Persians, the Turks, and the Moors, are to a certain degree civilized ; but the Arabians have, for the most part, remained in a state of independence, which implies a contempt of laws. They live, like the Tartars, without order, without government, and almost without society. Theft, robbery, and violence, are authorized by their chiefs. They glory in their vices ; and of all human conventions, those only have they admitted which owe their existence to fanaticism and superstition.

They are a people much inured to labour ; and to it they habituate their horses. They allow this animal to eat and drink but once in twenty-four hours ; and though their horses are meagre, they are excellent coursers, and seem indefatigable.

The Egyptian women are very brown ; their eyes are lively ; their stature is rather low ; their mode of dress is by no means agreeable ; and their conversation

is perfectly tiresome. But though the women of Egypt are commonly rather short, yet the men are of a good height. Both are of an olive colour; and the farther we remove from Cairo, the more we find the people tawny, till we reach the confines of Nubia, where they are as black as the Nubians themselves.

The most inherent defects of the Egyptians are idleness and cowardice. They do nothing almost the whole day but drink coffee, smoke, sleep, remain indolent in one place, or chatter in the streets. They are highly ignorant, and are full of the most ridiculous vanity. Though they cannot deny but that they have lost every thing noble they once possessed; the sciences, the exercise of arms, their history, and even their language; and that, from an illustrious and a valiant nation, they have become a people dastardly and enslaved; they scruple not to despise all other nations, and to take offence at the bare offer of carrying their children into Europe, in order to initiate them in the arts and sciences.

“The women of Circassia,” says Struys, “are exceedingly fair and beautiful. Their complexion is incomparably fine; their forehead is large and smooth; and, without the assistance of art, their eye-brows are so delicate, that they appear as threads of silk. Their eyes are large, soft, and full of animation, their mouth is small and expressive of a smile, and their chin forms a perfect oval. Their neck and breasts are admirably formed; their stature is tall, and the shape of their body easy; their skin, is white as snow, and their hair of the most beautiful black. They wear a little cap of a black stuff, over which they fasten a roller of the same colour; but, what is truly ridiculous, is, that, instead of this roller, the widows wear the blad-

der of an ox, or a cow, inflated as much as possible, by which they disfigure themselves amazingly. In the summer months the inferior classes wear nothing but a shift, which is open down to the middle, and which is generally of a blue, yellow, or red colour. They are tolerably familiar with strangers, but at the same time faithful to their husbands, who are by no means jealous of them."

The Turks, who purchase a vast number of these women as slaves, are a people composed of many different nations. From the Armenians, the Georgians, the Turcomans, intermixing in the time of the crusades with the Arabians, the Egyptians, and even the Europeans, it is hardly possible to distinguish the native inhabitants of Asia Minor, of Syria, and of the rest of Turkey. The Turkish men are generally robust, and tolerably well-made; and it is even rare to find among them persons either hump-backed or lame. The women are generally beautiful, well-proportioned and free from blemishes. They are very fair, because they seldom stir from home; and when they go abroad they are always veiled.

Before the Czar Peter I. we are told, that the Muscovites had not emerged from barbarism. Born in slavery, they were ignorant, brutal, cruel, and destitute of courage. Men and women bathed promiscuously in stoves heated to a degree intolerable to all persons but themselves; and on quitting this warm bath, they plunged, like the Laplanders, into cold water. Their food was homely; and their favourite dishes were cucumbers, or melons, of Astracan, which, in summer, they preserved in a mixture of water, flour, and salt. From ridiculous scruples they abstained from several viands, amongst which were

pigeons and veal. Nevertheless, at this period of rudeness, the women were skilful in the arts of colouring the skin, of plucking out the eye-brows, and of painting artificial ones. They also adorned themselves with pearls and jewels, and their garments were made of rich and valuable stuffs. From these circumstances does it not appear, that the barbarism of the Muscovites was near a close, and that their sovereign had less trouble in polishing them than some authors have endeavoured to insinuate? They are now a people in some degree civilized and commercial, fond of spectacles, and of other ingenious novelties.

From the regions of Europe and Asia, our attention is now to be directed to a race of people differing more from ourselves in external appearances than any we have hitherto mentioned.

In the seventeenth or eighteenth degree of north latitude, on the African coast, we find the negroes of Senegal and of Nubia, some in the neighbourhood of the ocean, and others in that of the red sea. After them, all the nations of Africa, from the latitude of eighteen North to that of eighteen South, are black; the Ethiopians, or Abyssinians, excepted. It appears, then, that the portion of the globe which Nature has allotted to this race of men, contains an extent of ground, parallel to the equator, of about nine hundred leagues in breadth, and considerably more in length, especially northward of the equator. Beyond the latitude of eighteen or twenty, there are no more negroes, as will appear when we come to speak of the Caffres, and of the Hottentots.

By confounding them with their neighbours the Nubians, we have been long in an error, with respect

to the colour, and the features of the visage of the Ethiopians. Marmot says, that the Ethiopians are absolutely black, that their visage is large, and their nose flat ; and in this description the Dutch travellers agree with him. The truth, however, is, that they differ from the Nubians, both in colour and in features. The skin of the Ethiopians is brown, or olive-coloured, like that of the southern Arabians, from whom, it is probable, they derive their origin. In stature they are tall : the features of their countenance are strongly marked : their eyes are large and beautiful : their nose is well-proportioned : their lips are thin ; and their teeth are white. Of the inhabitants of Nubia, on the contrary, the nose is flat, the lips are thick and prominent, and the countenance is exceeding black. These Nubians, as well as the Barberins, their western neighbours, are a species of Negroes not unlike those of Senegal.

The Ethiopians are a people between the extremes of barbarism and of civilization. Their garments are of cotton, though those of the more opulent are of silk. Their houses are low, and of a bad construction. Their lands, too, are wretchedly neglected. These circumstances are owing to the behaviour of their nobles, who despise the tradesmen and the common people. Each of these classes, however, lives separate from the other, and has its own villages or hamlets. Unprovided with salt at home, they purchase it from abroad for its weight in gold. So fond are they of raw meat, that, at their feasts, the second course, which is considered as the most delicate, consists of it entirely. Though they have vines they have no wine ; and their usual beverage is a sour composition made with tamarinds. They use horses for the pur-

pose of travelling, and mules for that of carrying their merchandise. Of the arts or sciences they have little knowledge. Their language is without rules ; and their manner of writing, though their characters are more beautiful than those of the Arabians, is so imperfect, that they take several days to write a letter. In their mode of salutation there is something exceedingly whimsical. Each takes the right hand of the other, and carries it to his mouth ; after, the saluter takes off the scarf of the person saluted, and fastens it round his own body : Thus the latter is left half naked, few of the Ethiopians wearing any more than this scarf, and a pair of cotton drawers.

The first Negroes we meet with are those who live on the south side of Senegal. These people, as well as those who occupy the different territories between Senegal and Gambia, are called *Jalofes*. They are all very black, well-proportioned, and of a size sufficiently tall. Their features are less harsh than those of the Negroes ; and some of them, especially of the female sex, have features that are far from being irregular. With respect to beauty, they value fine eyes, a well made nose and mouth, and lips of a proportional smallness. With respect to the ground of the picture alone do they differ from us ; for, with them, the colour must be exceedingly black and glossy. Their skin, however, is highly delicate, and soft ; and, colour excepted, we find among them women as handsome as in any other country of the world. They are usually very gay, lively, and amorous.

Father du Tertre says expressly, that if the Negroes are for the most part flat-nosed, it is because the parents crush the noses of their children. He adds, that they compress their lips too, in order to render them

more thick ; and that, of the few who have undergone neither of these operations, the features of the countenance are as comely, the nose is as prominent, and the lips are as delicate, as those of the Europeans. It appears, however, that among the Negroes in general, thick lips and a nose broad and flat, are gifts from nature, by which was originally introduced, and at length established, their custom of flattening the nose and thickening the lips of such as, at their birth, discovered a deficiency in these ornaments.

Though the Negroes of Guinea are in general very healthy, yet they seldom attain what we term old age. In his own country, a Negroe at the age of fifty, is a very old man ; and so early as that of forty, he discovers all the marks of being so.

The Negroes in general are remarkably innocent and inoffensive. If properly fed, and not exposed to bad usage, they are contented, joyous, and obliging ; and on their very countenance we may read the satisfaction of their soul. If hardly dealt with, on the other hand, their spirits forsake them, and they droop with sorrow. Alike impressed with a sense of what injuries, and of what favours they have received, to a cruel master they are implacable foes. But to an indulgent one, they are servants who will exert every effort of which human nature is capable, in order to express to him their zeal and attachment. To their children, their friends, their countrymen, they are naturally compassionate and tender. Contented with the little they have, they communicate a share to whose who are in indigence, That they have an excellent heart, therefore, is evident ; and, in having this, they have the seed of every virtue. Their sufferings demand a tear. Are they not already

sufficiently unhappy in being reduced to a state of slavery ; in being obliged to work without reaping the smallest fruits of their labour ? To crown their wretchedness, must they be abused, buffeted, treated like brutes ? Humanity revolts at the idea of a conduct, which nothing but the thirst of gold could ever have introduced, and of which, every day will produce an aggravated repetition, till an enlightened legislature shall put an end to a traffic which disgraces human nature.

Mr Kolbe, though he has given so minute a description of the Hottentots, is strongly of opinion, however, that they are negroes. Like that of the latter, he assures us, their hair is short, black, frizzled, and woolly ; nor in a single instance did he ever observe it long.

Though of all the Hottentots the nose is very flat, and very broad, yet it would not be of that form, did not their mothers, considering a prominent nose as a deformity, crush it presently after their birth. Their lips are also thick, and their upper lip is particularly so : their teeth are very white ; their eye-brows are thick ; their head is large ; their body is meagre ; and their limbs are slender. They seldom live above forty years ; and of this short duration of life, the causes, no doubt, are, their residing continually in the midst of filth, as also their living upon meat that is tainted, of which indeed their nourishment chiefly consists. I might dwell longer upon the description of this nasty people ; but as most travellers have already given very accurate accounts of them, it might be thought unnecessary in this place. One fact, however, related by Tavernier, I ought not to pass in silence. The Dutch, he says, once took a Hottentot girl, soon after her birth ; and, after bringing her up among them—

selves, she became as white as an European. From this circumstance he presumes, that all the Hottentots would be tolerably white, were it not for their custom of perpetually begriming themselves.

Though in America we observe less variety in the human form than might be expected, it cannot be supposed, but that in such a diversity of climates and situations, a considerable diversity of inhabitants must also be found.

In beginning our inquiries, then, we find in the most northern parts of America a species of Laplanders, similar to those of Europe, or to the Samoeids of Asia; and though, in comparison of the latter, they are few in number, yet they are diffused over a very considerable extent of ground. Those who inhabit the lands of Davis's Straits, are of a diminutive size, of an olive complexion, and their legs are short and thick. They are skilful fishers. They eat their fish and their meat raw. Their drink consists of pure water, or of the blood of the dog-fish. They are also very strong, and generally live to a great age. Here, we see, therefore, the figure, the colour, and the manners of the Laplanders. But what is truly singular is, that, as among the Laplanders of Europe we meet with the Finlanders who are white, comely, tolerably tall, and tolerably well made; so, among the Laplanders of America, we meet with another species of men, tall, well made, tolerably white, and with features exceedingly regular.

Of a different race from the former seem to be the savages of Hudson's Bay, and northward of the land of Labrador. They are ugly, however, diminutive, and unshapely; and their visage is almost entirely covered with hair, like the savages of the country of

Yeco, northward of Japan. In summer they dwell under tents made of skins of the rein-deer. In winter they live under ground, like the Laplanders and the Samoeids, and, like them, sleep together promiscuously, and without the smallest distinction. They likewise live to a great age, though they feed on nothing but raw meat and fish. The savages of Newfoundland have a considerable resemblance to those of Davis's Straits: they are low in stature: they have little or no beard: their visage is broad and flat: their eyes are large: they are generally rather flat-nosed; and, upon the whole, are far from being unlike the savages of the north continent, and of the environs of Greenland.

Besides these savages, who are scattered over the most northern parts of America, we find greater numbers, and which are perfectly different, in Canada and in the vast extent of land to the Assiniboils. These are tolerably tall, robust, vigorous, and well made. They have hair, and eyes black, teeth, very white, a complexion, tawny, beard, scanty, and over the whole of their body hardly a vestige of hair. They are hardy, indefatigable walkers, and very nimble runners. They are alike unaffected by excesses of hunger, and of satiety. They are by nature bold and fierce, grave and sedate. So strongly, indeed, do they resemble the Oriental Tartars in the colour of the skin, the hair, and the eyes, in the scantiness of beard, and of hair, as also in disposition, and in manners, that, were they not separated from each other by an immense sea, we should conclude them to be descended from that nation. In point of latitude their situation is also the same, which still farther proves how powerfully the climate influences, not only the colour, but the figure of men.

Mr Fabry, who travelled a prodigious way to the north-west of the Mississippi, and visited places which no European had done before him, and of which consequently, the savage inhabitants had not been destroyed, has assured me, that that part of America is so deserted, that he often travelled a hundred, and two hundred leagues, without observing a single human face, or the smallest vestige of a habitation. He adds, that, whenever he did meet with any habitations they were always at immense distances from one another ; and that, in each of them, there was frequently not above one family. Sometimes he says there were two or three families, but never above twenty persons together ; and between these twenty persons and twenty others, there was generally a space of a hundred leagues at least.

To dwell long on the customs of such savage nations, would, in my opinion, be unnecessary. It has not been always attended to by authors, that what they have given us for established customs, and for the manners of a community, were nothing more than actions peculiar to a few individuals, and often determined by circumstances, or by caprice. Some nations they tell us, eat their enemies, some burn them, and some mutilate them. One nation, they say, is perpetually at war ; and of another, the grand object is to live in peace ; in one country, the child kills his parent, when he has lived to a certain age ; and in another, the parent eats his child. All these stories, on which travellers have with so much complacency enlarged, mean nothing more than that one savage had devoured his enemy, another had burned or mutilated him, and a third had killed or eaten his child. All these things may be known to happen in one, as

well as in several savage nations. For every nation in which there is no government, no law, no master, no habitual society, ought rather to be termed a tumultuous assemblage of men, barbarous and independent. Men who obey nothing but their own private passions, and who incapable of having a common interest, are also incapable of pursuing one object, and of submitting to fixed and settled usages.

If, however, in the whole of North America there were none but savages to be met with, in Mexico and in Peru there were found nations, polished, subjected to laws, governed by kings, industrious, acquainted with the arts, and not destitute of religion.

In the present state of these countries, so intermixed are the inhabitants of Mexico and New Spain, that we hardly meet with two visages of the same colour. In the town of Mexico, there are white men from Europe, Indians from the north and from the south of America, and negroes from Africa, &c. inso-much, that the colour of the people exhibits every different shade which can subsist between black and white. The real natives of the country are very brown, and of an olive colour, well made, and active; and though they have little hair, even upon the eyebrows, yet upon their head, their hair is very long, and very black.

In surveying the different appearances which the human form assumes in the different regions of the earth, the most striking circumstance is that of colour. This circumstance has been attributed to various causes; but in my opinion experience warrants us to affirm that the heat of the climate is the principal one. When this heat is excessive, as at Senegal and in Guinea, the inhabitants are entirely black. When it is

rather less violent, as on the eastern coasts of Africa, they are of a shade more light. When it begins to be somewhat more temperate, as in Barbary, in India, in Arabia &c. they are only brown; and, when it is altogether temperate, as in Europe and Asia, they are white. These varieties are wholly owing to their various modes of living. All the Tartars, for example, are tawny, while the Europeans, who live in the same latitude, are white. Of this difference the reasons seem to be, that the former are always exposed to the air; that they have no towns, no fixed habitations; that they sleep upon the earth, and live coarsely in every respect. These circumstances alone are sufficient to render them less white than the Europeans, to whom nothing is wanting which may render life comfortable and agreeable. Why are the Chinese more white than the Tartars, whom they resemble in all the features of the visage? It is because they live in towns, because they are civilized, because they are provided with every expedient for defending themselves from the injuries of the weather, to which the Tartars are continually exposed.

When cold becomes extreme, however, it produces some effects similar to those of excessive heat. The Samoeids, the Laplanders, the Greenlanders, are very tawny; and it is even asserted, as we have already observed, that among the Greenlanders there are men as black as those of Africa. Violent cold, and violent heat, produce the same effect upon the skin; for these two causes act by one quality, which they possess in common. This quality is dryness; and as it is a quality of which intense cold is equally productive as intense heat, so by the former, as well as by the latter, the skin may be dried up, altered, and render-

ed as tawny as what we find it among the Laplanders. Cold compresses, shrivels, and reduces within a narrow compass all the productions of nature. Hence we find the Laplanders, who are perpetually exposed to all the rigours of the most piercing cold, the most diminutive of the human species.

The most temperate climate is between the degrees of forty and fifty. There we behold the human form in its greatest perfection; and there we ought to form our ideas of the real and natural colour of man. Situated under this zone, the civilized countries are, Georgia, Circassia, the Ukarine, European, Turkey, Hungary, South Germany, Italy, Switzerland, France, and the North of Spain. Of the latter, the inhabitants are the most beautiful, and the most shapely in the world.

As the first, and almost the sole cause of the colour of mankind, we ought therefore to consider the climate; and though upon the skin the effects of nourishment are trifling, when compared with those of the air and soil, yet upon the form they are prodigious. Food which is gross, unwholesome, or badly prepared, has a strong and a natural tendency to produce a degeneracy in the human species. Hence in all countries where the people fare wretchedly, they are more ugly, and more deformed than their neighbours.

The air and the soil have also great influences, not only on the form of men, but on that of animals, and of vegetables. In comparing the peasants who live on hilly grounds, with those who live embosomed in the neighbouring vallies, we find, that the former are active, nimble, well-shaped, and lively; and the women generally handsome. On the contrary, the

latter, in proportion as the air, food, and water are gross, are clumsy, and less active and vigorous.

From every circumstance, therefore, we may obtain a proof, that mankind are not composed of species essentially different from each other. It appears, on the contrary, that there was originally but one individual species of men, which after being multiplied and diffused over the whole surface of the earth, underwent divers changes from the influence of the climate, from the difference of food, and of the mode of living, from epidemical distempers, as also from the intermixture, varied *ad infinitum*, of individuals more or less resembling each other: at first, these alterations were less considerable, and confined to individuals; but afterwards, from the continued action of the above causes becoming more general, more sensible, and more fixed, they formed varieties in the species. These varieties have been, and are still perpetuated from generation to generation, in the same manner as certain deformities, and certain maladies, pass from parents to their children. And in short, as these varieties would never have been produced but by a concurrence of external and accidental causes, as they would never have been confirmed and rendered permanent, but by time, and by the continued action of these causes; so it is highly probable, that in time they would in like manner gradually disappear, or even become different from what they at present are, if such causes were no longer to subsist.

CHAP. VII.

OF QUADRUPEDS IN GENERAL--OF DOMESTIC ANIMALS

—THE HORSE—THE ASS—THE OX—THE SHEEP

—THE GOAT—OF THE SWINE—THE WILD

BOAR, &c.

UPON comparing the various animals of the globe with each other, we shall find, that Quadrupeds demand the rank immediately next ourselves; and, consequently, come first in consideration. The similitude between the structure of their bodies and our own, those instincts which they seem to enjoy in a superior degree to the other classes that live in air or water, their constant services to man, or the unceasing enmity they bear him, all render them the foremost objects of his curiosity, the most interesting part of animated nature.

In the first ages of the world it is probable, that all living creatures were nearer an equality than at present. Man, while yet savage himself, was but ill qualified to civilize the forest. While yet naked, unarmed, and without shelter, every wild beast was a formidable rival, and the destruction of such was the first employment of heroes. But when he began to multiply, and arts to accumulate, he soon cleared the plains of its brute inhabitants; he soon established an empire over all the orders of animated nature; part was taken under his protection and care, while the rest found a precarious refuge in the burning desert of the howling wilderness.

The most obvious and simple division therefore of Quadrupeds, is into the domestic and savage; by domestic I mean, such as man has taken into friendship, or reduced to obedience; by the savage, those who

still preserve their natural independence and ferocity ; who either oppose force by force, or find safety in swiftness or cunning.

The savage animal preserves at once his liberty and instinct, but man seems to have changed the very nature of domestic animals by cultivation and care. A domestic animal is a slave, which has few other desires, but those which man is willing to grant it. Humble, patient, resigned, and attentive, it fills up the duties assigned, ready for labour, and content with subsistence.

Thus we, in some measure, see nature under a continual constraint, in those creatures we have taught to live about us ; but it is otherwise when we come to examine the savage tenants of the forest, or the wilderness ; there every species preserves its characteristic form, and is strongly imprest with the instincts and appetites of nature. The more remote from the tyranny of mankind, the greater seems their sagacity ; the Beavers, in those distant solitudes, where men have rarely past, exert all the arts of architects and citizens ; they build neater habitations than even the rational inhabitants of those countries can shew, and obey a more regular discipline than ever man could boast ; but as soon as man intrudes upon their society, their spirit of industry and wisdom ceases ; they no longer exert their social arts, but become patient and dull, as if to fit them for a state of servitude.

But not only their industry, but their courage is repress by the vicinity of man : the Lion of the deserts of Nubia, that has been only taught to measure his strength with weaker animals, and accustomed to conquer, is possessed of amazing courage ; instead of avoiding man, as other animals are found to do, he

attacks whole caravans crossing the desert, and when over-powered, retires still facing the enemy. But the Lion of Morocco, which is a more populous country, seems to acknowledge a superiority, and is even scared away by the cries of women and children.

It is in the forest therefore, and remote from man, that we must expect to find those varieties, instincts, and amazing instances of courage and cunning, which Quadrupeds exert in a very high degree.

The heads of Quadrupeds are variously formed, corresponding to their different manner of subsisting: in the porcine species, it is sharp, as their food is chiefly under ground: in the canine, which pursue their prey by scent, it is long, in order to afford room for the olfactory nerves: in others, which are frequently engaged in combat, it is short and strong, as in the lion. Their teeth also are adapted to the nature of their food: in those which live on vegetables, they are edged before, for cropping grass and herbs: in carnivorous animals, the fore teeth are sharp, for holding and dividing; and farther in the mouth, they turn broad with unequal, rugged surfaces, to render the aliment fit to assimilate with the fluids in the stomach. Their feet and legs are also adapted to them; those which live on fish have webbed feet; and beasts of prey have claws which they can sheathe or unsheathe at pleasure. The stomachs of quadrupeds are formed according to their diet; those which eat flesh, have it small and glandular, while those which eat vegetables, have it very large. Some animals which chew the cud have four stomachs; but in Africa, where the plants are soft and nutritious, only two.

The first aliment of all quadrupeds is milk, which is a liquor at once both nourishing, and easily digested,

this being in carnivorous animals in much less quantity than others, the female often carries home her prey alive, that its blood may supply the deficiencies of nature in herself.

Whatever be the natural disposition of animals at other times, they all acquire new courage and fierceness in defence of their young; even the mildest, if wild, will then resist and threaten the invader; but such as have force, and subsist by rapine, are at such times uncommonly terrible.

But their care in the protection of their young, is not greater than their sagacity in chusing such months for bringing forth, as afford the greatest quantity of provision, suitable to the age and appetite of each peculiar kind. In general they couple at such times as that the female shall bring forth in the mildest seasons, such as the latter end of spring, or the beginning of autumn. The wolf and the fox, for instance, couple in December, so that the time of gestation continuing five months, they may have their young in April. The mare who goes eleven months, admits the horse in summer, and foals in the beginning of May. On the contrary, all those which lay up provisions for the winter, as the beaver and marmot, couple in the latter end of autumn, so as to have their young about January, for which severe season they have already laid in the proper supplies. This provisional care in every species of quadrupeds, of bringing forth at the fittest seasons, may well excite human admiration; in man the business of procreation is not marked by seasons, but brutes seem to decline indeterminate copulations, as if conducted less by appetite than the future subsistence of their offspring.

THE HORSE.

THE noblest conquest ever made by man, is that of this spirited animal, which shares with him the fatigues of the war, and the glory of the combat. Equally intrepid as his master, the horse sees the danger, and braves it. Inspired at the clash of arms, he loves it, he seeks it, and is animated with the same ardour. He feels pleasure also in the chase, in tournaments, in the course. He is all fire, but equally tractable as courageous, does not give way to his impetuosity, and knows how to check his inclinations. He not only submits to the arm which guides him, but even seems to consult the desires of his rider; and, always obedient to the impressions which he receives from him, presses on, moves gently, or stops, as his rider pleases. The horse is a creature which renounces his being, to exist only by the will of another, which he even knows how to anticipate, and execute by the promptitude and exactness of his movements. He feels as much as we desire, does only what we wish, gives himself up without reserve, and

refuses nothing, makes use of all his strength, exerts himself beyond it, and even dies to obey us.

Such is the Horse, whose natural qualities art has improved, which from the earliest ages has been broken to the service of man. His education commences with the loss of his liberty, and by constraint it is finished. The servitude of these creatures is universal, and so ancient that we rarely see them in their natural state. They are never wholly free from all their bands, not even at the time of rest ; and if they are sometimes suffered to range at liberty in the fields they always bear about them the marks of servitude, and frequently the cruel marks of labour and of pain. The mouth is deformed by the wrinkles occasioned by the bit, the flank scarred with wounds, inflicted by the spur, the hoofs are pierced by nails, and the attitude of the body constrained by habitual shackles. Even those whose servitude is the most gentle, who are only fed and broken for luxury and magnificence, and whose golden chains serve less to decorate them, than to satisfy the vanity of their master, are still more dishonoured by the elegance of their trappings, by the tresses of their manes, by the gold and silk with which they are covered, than by the iron shoes on their feet.

Nature is more beautiful than art, and in an animated being, the freedom of its movements makes nature beautiful. Observe the horses in Spanish America, that live wild ; their gait, their running, or their leaping, seem neither constrained nor regular. Proud of their independence, they fly the presence of man, and disdain his care. They wander about in liberty, in immense meads, where they feed on the fresh productions, of an eternal spring. Destitute of

any fixed habitation, without any other shelter than a mild sky, they breathe a purer air than those that are confined in vaulted palaces. These wild horses are also much stronger, much swifter, and more nervous, than the greater part of domestic horses. They have, what nature has bestowed upon them, strength and nobleness. The others, only what art can give, beauty and cunning.

The natural disposition of these animals is not ferocious, for though superior in strength to the greatest part of animals, they never attack them; and if they are attacked by others, they either disdain them or trample them under their feet. They herd together, as they are not fearful of but fond of one another. As herbs and vegetables are sufficient for their nourishment, they have quite enough to satisfy their appetite; and as they have no relish for the flesh of animals, they never make war with them, nor with themselves. They live in peace, because their appetite is simple and moderate; and, as they have enough, there is no room for envy.

As all parts of Europe are at present peopled, and almost equally inhabited, wild horses are no longer found there; and those which we see in America, were originally European tame horses, which have multiplied in the vast deserts of that country. The astonishment and fear which the inhabitants of Mexico and Peru expressed at the sight of horses and their riders, convinced the Spaniards that this animal was entirely unknown in these countries. They therefore carried thither a great number as well for service, and their particular utility, as to propagate the breed. M. de la Salle, in 1685, saw, in the northern parts of America, near the Bay of St Louis, whole troops

of these wild horses feeding in the pastures, which were so fierce that nobody durst approach them. The Author of the History of the Adventures of the Buccaneers, says, that in the island of St Domingo, horses may sometimes be seen in troops of upwards of five hundred running together, and that as soon as they see a man, they will stop. He adds, that one of them will approach to a certain distance, snort, take flight, and then all the rest will follow him. To catch them, they make use of nooses made of ropes, which they spread and hang in places which they know they frequent. If they are caught by the neck they strangle themselves, unless the huntsman hastes their assistance, who instantly secures them by the to body and the legs, and fastens them to trees, where they are left for two days without either food or drink. This experiment is sufficient to begin to make them tractable and in time they become as much so as if they had never been wild; and even, if by chance they ever regain their liberty, they know their masters, and suffer them to catch them again without trouble.

The manners of these animals almost wholly depend on their education. From time immemorial it has been the custom to separate the colts from their mothers after they have suckled them five, six, or seven months; for experience has taught, that those colts which are suckled ten or eleven months, are not of equal value with those which are weaned sooner, though they are generally fuller of flesh. After six or seven months sucking, they are weaned, that they may take more solid nourishment than milk. Bran is then given them twice a-day, and a little hay, of which the quantity is increased in proportion as they

advance in age, and they are kept in the stable as long as they seem to retain any desire to return to the mare ; but when this desire ceases, they are suffered to go out in fine weather, and led to pasture. Care, however, must be taken not to suffer them to go out to pasture fasting. They must have bran, and be made to drink an hour before they are suffered to graze, and are never to be exposed to great cold or rain. In this manner they spend the first winter. In the May following, they are not only permitted to graze every day, but are suffered to lie in the fields all the summer, and even to the end of October, only they must not be allowed to eat the after-grass ; for if they accustom themselves much to it, they will grow disgusted with hay, which ought, however, to be their principal food during the second winter, together with bran mixed with barley, or oats wetted. They are managed in this manner, letting them graze in the day time during winter, and in the night also during the summer, till they are four years old, when they are taken from the pastures, and fed on hay. This change in food requires some precaution ; for the first eight days, the colt should have nothing but straw and it is proper to administer some vermifuge drinks, as those insects may have been generated from indigestion, and green food.

Great attention must be paid in weaning young colts, to put them into a proper stable, not too hot, for fear of rendering them too delicate and sensible to the impressions of the air. They should frequently have fresh litter, and be kept very clean, by rubbing them often down with a wisp of straw. But they should not be tied up or curried till they are two years and a half, or three years old ; for this gives

them great pain, their skin being too delicate to bear it, and they would fall away instead of growing fat from it. Care too must be taken that the rack and manger are not very high, the necessity of raising their heads too high in order to reach their food, may possibly give a habit of carrying it in this fashion, which would give them an awkward appearance.

At the age of three years, or three and a half, the rider should begin to break them and make them tractable. They should at first have a light easy saddle, and ought to wear it two or three hours every day, and they should be accustomed to have a snaffle bit in their mouths, and to lift up their feet, on which they should sometimes receive rather smart strokes, and if designed for coach or draught horses, should wear harness and a bridle. At first a curb should not be used, they should be held by a leather strap, and be made to trot, on even ground, without a rider, and with only the saddle or harness on the body. When the saddle horse turns easily, and willingly follows the person who holds the leather strap, the rough rider should mount him and dismount again in the same place, without making him move, till he is four years old, because, before that age, the weight of a man overloads him; but at four he should be made to walk or trot, a little way at a time, with the rider on his back. When a coach horse is accustomed to the harness, he should be paired with a horse that is thoroughly broke, putting on him a bridle, with a strap passed through it, till he begins to be used to the draught. After this the coach-man must teach him to back, having the assistance of a man before, who must push him gently back, and even give him some blows to make him do it. All this should be done before

young horses have changed their food, for when once they are what is called corn-fed, that is, when they feed on grain and hay, as they are more vigorous, it is remarked also that they are less tractable, and more difficult to break.

The bit and the spur are two means made use of to bring them into subjection. The mouth does not appear formed by nature to receive any other impressions than that of taste and appetite; there is, however, so great a sensibility in the mouth of a horse, that in preference to the eyes and ears, we address ourselves to it, to make him understand our pleasure. The smallest motions or pressure of the bit, is sufficient to inform and determine the animal; and this organ of sense has no other fault than its perfection. Its too great sensibility must be managed, for if it is abused, the mouth of the horse is rendered insensible to the impression of the bit. The senses of sight and hearing are not subject to such a change, and could not be dulled in this manner; but, it has been found inconvenient to govern horses by these organs, and it is generally true, that signs given them by the sense of feeling have more effect on animals in general than those conveyed by the eyes or ears. Besides, the situation of horses with relation to those who mount or conduct them, makes their eyes almost useless for this purpose, because they see only straight forwards. Hence they could only perceive the signs made to them when they turned their heads round; and although they are frequently conducted and animated by the ear, yet in fact, if they are well broken, the smallest pressure of the thighs, or most trifling motion of the bit, is sufficient to direct them. The spur is even useless, or at least it is only made use of to force

them to violent motions ; and as, through the unskillfulness of the rider, it often happens that in giving the spur he checks the bridle ; the horse, finding himself excited on one side, and kept in on the other, only prances and capers without stirring out of his place.

By means of the bridle we teach horses to hold up their heads, and place them in a proper manner, and the smallest sign or movement of the rider is sufficient to make the horse shew all his different paces. The most natural is perhaps the trot, but pacing and galloping are more pleasant for the rider, and these are the two paces we particularly endeavour to improve.

Though walking is the slowest of all their paces, a horse should, notwithstanding, step quick, and neither take too long nor too short steps. His carriage should be easy, this ease depends much on the liberty of his shoulders, and is known by the manner in which he carries his head in walking. If he keep it high and steady, he is generally vigorous, quick, and free in his motions. When the motion of the shoulders is not free, the leg does not rise enough, and the horse is apt to stumble, and strike his foot against the inequalities on the ground. When, on the other hand the shoulders are more confined in their action, and the motion of the legs appears free, the horse is soon fatigued, stumbles, and becomes useless. A horse should raise his shoulders, and his lower haunches in walking. He should also support his leg, and raise it high enough, but if he keep it up too long, or let it fall too slowly, he loses all the advantage of his suppleness, and becomes quite heavy.

It is not sufficient that his walk should be easy, his steps must be also equal and uniform both behind and before, for if his buttocks have a swinging motion,

whilst he keeps up his shoulders, the rider is much jolted. The same thing happens when the horse extends his hind leg too much, and rests it almost in the same place in which he rested his fore foot. Horses with short bodies are subject to this fault. Those which cross their legs or strike them against each other, are not sure footed. Those again whose bodies are long, are the most easy for the rider, because he is at a greater distance from the two centers of motion, the shoulders and haunches, and is therefore less sensible of the motion and jolting.

The usual method of walking among quadrupeds, is to lift up one of the fore legs and one of the hind legs together. Whilst the right fore leg is in motion, the left hind leg follows and advances at the same time, and this step being made, the left fore leg conjointly with the right hind leg in its turn, and so on. As their bodies are supported upon four points of support, which form a long square, the easiest manner of moving for them, is to change two of them at once in a diagonal line, in such a manner, that the centre of gravity of the body of the animal may move but little, and rest always in the direction of the two points which are not in motion. In the three natural paces of the horse, the walk, the trot, and the gallop, this rule of motion is always observed, but with some difference. In the walk, there are four times in the movement; if the right fore leg moves first, the left hind leg follows the moment after, then the left fore leg moves forward in turn, to be followed the instant after by the right hind leg. Thus the right fore foot rests, on the ground first, the left hind foot next; then the left fore foot rests, and, lastly, the right hind foot, which makes a movement of four times, and at

three intervals, of which, the first and last are shorter than the middle one. In the trot there are but two times in the movement; if the right fore leg goes off first, the left hind leg moves at the same time, and without any interval between the motion of the one and the motion of the other; the left fore leg moves also at the same time with the right hind one.

In the gallop there is usually three times; but as in this movement there is a kind of leaping, the interior parts of the horse do not move of themselves, but are driven away by the strength of the haunches and the hinder parts. Thus, of the two fore legs, the right ought to advance more forward than the left. The left ought beforehand to rest on the ground to serve as a point of rest for the sudden jirk which he takes. Hence the left hind foot makes the first time of the movement, and rests on the ground first; then the right hind leg is lifted up conjointly with the left fore leg, and rest on the ground together. At length, the right fore leg, which is raised an instant after the left fore leg, and right hind one, rests on the ground last, which makes the third time. Thus, in this movement of the gallop, there are three times and two intervals; and in the first of these intervals, when the movement is made with haste, there is an instant when the four legs are in the air at the same time, and when the four shoes of the horse may be seen at once. When the horse has the haunches and the houghs supple, and moves them with agility, the movement of the gallop is more perfect, and the cadence is made in four times: he then rests the left hind foot, which shews the first time; when the right hind foot falls to the ground, and shews the second time, the left fore foot falls a moment after, shewing the third time;

and at length the right fore foot, which rests last, shews the fourth time.

Horses usually gallop on the right foot, in the same manner as they carry the fore right leg in walking and trotting. They also throw up the dirt in galloping with the right fore leg, which is more advanced than the left. The right hind leg which follows immediately the right fore one, is more advanced than the left hind leg, the whole time that the horse continues to gallop. Hence the left leg which supports all the weight, and which forces forwards the others, is more tired; for this reason it would be right to exercise horses in galloping alternately on the left foot, as well as on the right; and they would consequently bear much longer this violent motion.

In walking, the legs of the horse are lifted up only a small height, and the feet almost scrape the ground. In trotting they are raised higher, and the feet are entirely free from the ground. In galloping, the legs are lifted up still higher, and the feet seem to rebound from the earth. The walk, to be good, should be quick, easy, light, and sure. The trot should be firm, quick, and equally sustained. In this place, the horse should carry his head high, and his back straight; for, if the haunches rise and fall alternately at each trot he takes, if the crupper moves up and down, and the horse rocks himself, he trots ill. If he throws out his fore legs, it is another fault: the fore legs should tread in a line with the hind ones, which should always efface their tracks. When one of the hind legs is thrown forwards, if the fore leg of the same side remain in its place too long, the motion becomes more uneasy and difficult from this resistance. For this reason the interval between the two times of the

trot should be short; but, be it ever so short, this resistance is sufficient to make this pace more uneasy than walking and galloping; because in walking, the motion is more easy, gentle, and the resistance less; and in galloping there is scarcely any horizontal resistance, which is the only one inconvenient for the rider.

Walking, trotting, and galloping, are the most usual natural paces. Some horses, however, have another natural pace, called the amble, which is very different from the three others, and at the first glance appears contrary to the laws of mechanics. In this pace the foot of the horse grazes the ground still more than in walking, and each step is much longer. But the most remarkable circumstance is, that the two legs on the same side, set off at the same time to make a step, and afterwards the two other legs move at the same time to make another, so that each side of the body alternately is without support, and there is no equilibrium maintained between the one or the other. It is therefore only from his almost grazing the earth, and the quick alternate motion, that he can support himself in this pace. There is in the amble, as well as in the trot, but two times in the motion; and all the difference is, that in the trot the two legs which go together are opposite, and in a diagonal line; instead of which, in the amble, the legs on the same side go together. This pace is very easy for the rider, as it has not the jolting of the trot, which is occasioned from the resistance the fore leg meets with when the hind leg rises. Because in the amble, the fore leg rises at the same time with the hind leg on the same side: instead of which, in trotting, the fore leg on the same side rests and assists the impulse during the whole time that the hind leg is in motion.

Of all the large animals, the horse has the greatest proportion and elegance in every part of the body. The great length of the jaws is the principal cause of the difference between the heads of quadrupeds and of the human species. It is also the most ignoble mark of all; yet, though the jaws of the horse are very long, he has not, like the ass, an air of imbecility, or of stupidity like the ox. The regularity of the proportions of his head, on the contrary, gives him an air of sprightliness, which is well supported by the beauty of his chest. The horse seems desirous of raising himself above his state of a quadruped, by holding up his head, and in this noble attitude he looks man in his face. His eyes are lively and large, his ears well made, and of a just proportion, without being short like those of the bull, or too long like those of the ass. His mane suits well his head, ornaments his neck, and gives him an air of superiority. His long bushy tail covers and terminates advantageously the extremities of his body, far different from the short tails of the stag, the elephant, &c. and the naked tails of the ass, the camel, the rhinoceros, &c. The tail of the horse is formed of long, thick hair, which seems to come from his rump. He cannot raise his tail like the lion, but it suits him better hanging down, as he can move it sideways. It is very useful to him to drive away the flies which incommode him, for though his skin is very hard, and is every where furnished with a close thick coat, it is extremely sensible.

The head of a well-proportioned horse should be lean and small, without being too long. The ears should be at a moderate distance, small, straight, immoveable, narrow, thin, and well placed on the top of the head. The forehead should be narrow, and a little convex.

Hollows should be filled up, the eye-lids thin, the eyes clear, lively, full of fire, rather large, and projecting from the head ; the pupil large, the nether jaw thin, the nose a little aquiline, the nostrils large and open, the partition of the nose and the lips thin. The mouth ought to be of a moderate width, the withers raised and sloping, the shoulders thin, flat, and not confined, the back equal, even, and insensibly arched lengthways, and raised on each side of the spine, which should appear indented. His flanks should be full and short, the rump round and fleshy, the haunches well covered with hair, the stump of the tail thick and firm, the fore legs and thighs thick and fleshy, the knees round before, the houghs large and rounded, the sinew loose, the joint next the foot small, the fetlock not thickly covered with hair. The pastern ought to be large, and of a middling length, the coronet rather raised, the hoof black, smooth, shining, and high, the quarters round, the heels wide and moderately raised, the frog small and thin, and the sole thick and hollow.

But there are few horses in which this assemblage of perfection is to be found. The eyes are subject to many complaints, which are sometimes difficult to be known. In a healthy eye, we ought to see through the cornea two or three spots of the colour of soot, above the pupil. To see these spots, the cornea must be clear, clean, and transparent ; if it appears double, or of a bad colour, the eye is not good. A small, long, and straight pupil, encompassed with a white circle, is also a bad sign, and when it is of a blueish-green colour, the eye is certainly bad and the sight dull.

I shall at present only add some remarks, from which, as well as from the preceding, a judgment

may be formed of the principal perfections or imperfections of a horse. It is very easy to judge of the natural and actual state of the animal by the motion of his ears. When he walks, he should project forwards the points of his ears. A jaded horse carries his ears low ; those which are spirited and mischievous, alternately carry one of their ears forwards and one backwards. They all carry their ears on that side from which they hear any noise, and when any one strikes them on the back, or on the rump, they turn their ears back. Horses which have the eyes deep sunk in the head, or one smaller than the other, have usually a bad sight. Those which have the mouth dry, are not of so healthy a temperament as those which have the mouth moist, and make the bridle frothy. A saddle horse ought to have the shoulders flat, moveable, and not very fleshy. A draught horse, on the contrary, should have them flat, round, and brawny. If, notwithstanding, the shoulders of a saddle horse are too thin, it is a defect which shews the shoulders are not free, and consequently the horse cannot bear fatigue. Another fault of a saddle horse is, to have the chest project too far forward, and the fore legs drawn too much back, because he is apt to rest on the hand in galloping, and even to stumble and fall. The length of the legs should be proportionable to the height of the horse ; when the fore legs are too long, he is not sure footed ; if they are too short, he is too heavy in the hand. It is remarked that mares are more liable than horses to be short-legged, and that horses in general have the legs thicker than mares or geldings.

The age of the horse is known from his teeth. He has forty ; twenty-four grinders, four eye teeth, and twelve incisive teeth. Mares have no eye teeth, or if

they have them they are very short. The grinders are not instrumental to the knowledge of their age, we form our judgment from the front and eye teeth. The twelve front teeth begin to shew themselves fifteen days after the birth of the foal ; these first teeth are round, short, weak, and drop out at different times in order to make room for others. At two years and a half the four front middle teeth drop out the first, two at top and two at bottom ; a year after, four others fall out, one on each side of those which are already replaced. At about four years and a half, four others drop out, always on the side of those which have been replaced ; these four last milk teeth are replaced by four others, which do not grow near so fast as these which replaced the first eight ; and these four last teeth, which are called the wedges, and which replace the four last milk teeth, are those by which we know the age of a horse. These are easily known, since they are third as well at top as at bottom, beginning to count from the middle of the extremity of the jaw. These teeth are hollow, and have a black mark in their concavity. At four years and a half, or five years old, they scarcely project beyond the gums, and the hollow is plainly seen. At six and a half it begins to fill up, the mark also begins to diminish and grow narrower, and so continues till seven years and a half or eight years, when the hollow is entirely filled up, and the black mark effaced. After the animal has attained eight years, as these teeth do not give further information of the age, we generally judge by the eye teeth, or tusks. These four teeth are placed at the side of those which I have just now taken notice of. the eye teeth, as well as the grinders, are not preceded by others which fall out, those

of the inferior jaw usually come out first at three years and a half, and the two of the upper jaw at four years, and till they are six years old they are very sharp. At ten years old the upper ones appear already blunt, worn, and long, because they are bare, the gum wearing away with age, and the more they are worn away, the more aged the horse is. From ten till thirteen or fourteen years, there is hardly any indication of the age, but then some hairs on the eye-brows begin to grow white; but this indication is equivocal, since it has been remarked that horses engendered from old stallions and old mares have the hair white on the eye-brows at ten years old. There are also horses whose teeth are so hard that they do not wear, and upon which the black mark subsists, and is never effaced; and others which have the mark in the mouth as long as they live. We may also know, though with less precision, the age of a horse by the ridges of the palate, which are effaced in proportion to his age.

It has been remarked, that studs kept in dry and light countries produce good-tempered, swift, and vigorous horses, with nervous legs and hard hoofs; while, on the other hand, those which are bred in damp places, and in fat pasturage, have generally the head large and heavy, the legs thick, the hoofs soft, and the feet flat. This difference arises from the climate and food; but, what is more difficult to be accounted for, and what is still more essential than any thing that has been said, is, the necessity of always crossing or mixing the breed, if we would prevent their degenerating.

Mares usually go with foal eleven months and some days; they will breed commonly to the age of fourteen

or fifteen years, and the more vigorous till they are above eighteen years.

The duration of the life of horses is like that of every other species of animals, in proportion to the length of the time of their growth. Man who is above fourteen years in growing, lives six or seven times as long, that is ninety or a hundred years. The horse who attains his full growth in four years, lives six or seven times as long, that is twenty-five or thirty years. There are so few examples to contradict this rule, that we should not even regard them as exceptions from which we may draw any precedents. It is worthy of remark too, that as robust horses arrive at their full growth in less time than delicate ones, they also live less time, and at fifteen years of age are old.

The Arabian horses are the handsomest known in Europe, they are larger and plumper than those of Barbary, and equally well-shaped, but as they are not often brought into this country, riding-masters are not able to give an exact account of their perfections and defects.

The horses of Barbary are more common. They are frequently negligent in their paces, and must be often reminded. They are very swift and strong, light, and fit for hunting. These horses seem the most proper to breed from ; it were only to be wished that they were larger, as they seldom exceed four feet eight inches high.

The Turkish horses are not so well proportioned as those of Barbary. They will, however, travel a great way, and are long-winded. This is not surprising, if we consider, that in warm countries the bones of animals, are harder than in cold climates, and it is for this reason that they have more strength in the legs.

The Spanish horses hold the second rank after those of Barbary. Those of a handsome breed are plump, well-coated, and low. Their movements are likewise quick and supple, and they are remarkable for spirit and boldness. Their hair is usually black, or of a bay chesnut colour, though there are some of all colours, and it is but seldom that they have white legs and noses. The Spaniards, who have an aversion to these marks, never breed from horses that have them, choosing only a star in their forehead.

The handsomest English horses have in their conformation great resemblance to those of Arabia and Barbary, from which they originally sprung. They are frequently five feet high; and above. They are of all colours, and have all kinds of marks; they are generally strong, vigorous, bold, capable of great fatigue, and excellent for hunting and coursing.

The horses of Italy were formerly much handsomer than they are at present, because the breed for some time has been neglected. Notwithstanding this, there are still some handsome Neapolitan horses, especially draught ones; but, in general, they have the head large, and the chest thick. They are untractable, and consequently not easily managed; but these defects are compensated by their noble form, their stateliness and the beauty of their motions.

The Danish horses are so handsome in their form, and so beautiful in their coats, that they are preferred to all others for putting into carriages. They are of all colours, and even of some singular ones, as pied. Horses, however, spotted like tigers, are found nowhere but in Denmark.

In Germany we meet with very handsome horses; but they are generally heavy and short-breathed.

The Hussars and Hungarians split their nostrils, in order, they say, to give them more breath, and also to hinder their neighing in battle. The Flemish horses are greatly inferior to those of Holland: they have almost all large heads, flat feet, and are subject to humours in the eyes; and these two last are essential defects in coach-horses.

According to Marinol, the Arabian horses are descended from the wild horses of the deserts of Arabia, of which, in ancient times, large studs were formed, which have multiplied so much, that all Asia and Africa are full of them. They are so nimble, that some will outstrip the very ostriches in their course. The Arabians of the desert, and the people of Lybia, breed a great number of these horses for hunting, but they neither use them in travelling nor in their wars; they send them to pasture whilst there is grass for them; and when that fails, they feed them only with dates and camel's milk, which make them nervous, nimble, and lean. They lay snares for the wild horses, and eat the flesh of the young ones, which they affirm to be very delicate food. These wild horses are smaller than the tame ones, and are commonly ash-coloured, though there are also some white ones, and the mane and the hair of the tail is short and frizzled.

Let an Arabian be ever so poor, he has horses. They usually mount the mares, experience having taught them that they bear fatigue, hunger, and thirst, better than horses. The Turks, on the contrary, do not approve of mares; and the Arabians sell them the horses which they do not keep for stallions. They have long preserved, with great care, the breed of their horses; they know all their genealogy, and distinguish the breeds by different names. The lowest price for

a mare of the first class, is from one hundred, to two or three hundred pounds sterling. As the Arabians have only a tent for their house, it serves them also for a stable. The mare, colt, husband, wife, and children, lie promiscuously together; and the little children will lie on the body and neck of the mare and colt, without being in the least injured. These mares are so accustomed to live in this familiarity, that they will suffer any kind of play. The Arabians treat them kindly, talk and reason with them, and take great care of them, always let them walk, and never use the spur without necessity. Hence; as soon as they feel their flank tickled with the stirrup-iron, they set out immediately with incredible swiftness, and leap hedges and ditches with great agility. But if the rider happens to fall, they are so well trained, that they will stop short even in the most rapid gallop. All Arabian horses are of a middling size, very easy in their manner, and rather thin than fat. They are dressed morning and evening regularly, with so much care, that not the smallest spot is left on their skins. Their legs, mane, and tail, are also washed, which they let grow long, and seldom comb, to avoid breaking the hairs. They have nothing given them to eat all day, and seldom are allowed to drink above two or three times. At sunset, a bag is fastened round their heads, in which is about half a bushel of very clean barley. These horses, therefore, eat only during the night; and the bag is not taken from them till the next morning, when all is eaten up; and, in the month of March, when the grass is tolerably high, they are turned out to pasture. As soon as the spring is past, they are taken again from pasture, and have neither grass nor oats all the rest of the year, and straw but

seldom, barley being their only food. They do not neglect to cut the mane of the colts as soon as they are a year or eighteen months old, in order to make it grow thick and long. They mount them at two years old, or two years and a half at most. Till this age they put neither saddle nor bridle on them; but after it, all the Arabian horses stand saddled at the door of the tent, every day, from morning to night.

The breed of these horses is dispersed in Barbary, among the Moors, and even among the Negroes of the river Gambia and Senegal. The principal people of the country have some which are of uncommon beauty. Instead of barley or oats, they give them maize reduced to flour, which they mix with milk, when they are inclined to fatten them; and in this hot climate they seldom let them drink.

The Tartars live with their horses nearly in the same manner as the Arabians do. When they are about seven or eight months old, the young children mount them, and make them walk and gallop a little way by turns. They thus break them by degrees, and oblige them to submit to long fastings; but they never mount them for racing or hunting till they are six or seven years old, and then make them support incredible fatigue, such as travelling two or three days together without stopping, passing four or five without any other food than a handful of grass every eight hours. They also inure them to go twenty-four without drinking. These horses, which appear, and which are actually so robust in their own country, become enfeebled, and are soon good for nothing when transported to China or the Indies; but they succeed better in Persia and Turkey. In lesser Tartary they have also a breed of small horses, which are in such

estimation, that they are not allowed to sell them to foreigners. These horses have all the good and bad qualities of those of Great Tartary, which shews how much the same manners, and the same education give the same disposition to these animals. There are also in Circassia, and in Mingrelia, many horses which are even handsomer than those of Tartary. There are also found some handsome horses in the Ukraine, Walachia, Poland, and Sweden; but we have no particular account of their qualities and defects.

When the horse is inflamed with love, desire, or appetite, he shews his teeth, and seems to laugh. He shews them also when he is angry, and would bite. He sometimes puts out his tongue to lick, but less frequently than the ox, who licks much more than the horse, and who, notwithstanding, is less sensible to caresses.

The horse also remembers ill treatment much longer than the ox; his natural disposition and courage are such, that, when he finds more is expected from him than he is able to perform, he is irritated, and will not exert himself. Instead of which, the ox, who is slow and idle, exerts himself, and is more easily tired.

The horse sleeps much less than man; for when he is in health, he does not rest more than two or three hours together. He then gets up to eat; and when he is satisfied, he lies down a second time; but he does not sleep more than three or four hours in the twenty-four. There are even some horses who never lie down, but sleep standing. It has also been remarked, that geldings sleep oftener and longer than horses.

Quadrupeds do not all drink in the same manner, though they are all equally obliged to seek with the

head for the liquor, except the monkey, macaw, and some others that have hands, and consequently drink, like men, when a vase or glass is given them which they can hold. They carry this to their mouths, inclining the head, throwing down the liquor, and swallowing it by the simple motion of deglutition. Man usually drinks in the same manner, because it is most convenient. Most quadrupeds also choose that mode which is most agreeable to them, and constantly follow it. The dog, whose mouth is large, and whose tongue is long and thin, drinks lapping, which mode he prefers to that of wetting the nose. The horse, on the contrary, whose mouth is small, and whose tongue is too short and thick to scoop it up, and who always drinks with more avidity than he eats, dips the mouth and nose quickly and deeply into the water, which he swallows largely by the simple motion of deglutition. This, however, forces him to drink without breathing; whilst the dog breathes at his ease while he is drinking. Horses therefore should be suffered to take several draughts, especially after running, when respiration is short and quick. They should not, however, be suffered to drink the water too cold, because that, independently of the cholic, which cold water frequently occasions, it sometimes happens also, from the necessity they are in of dipping the nose into the water, that they catch cold, which often lays the foundation of a disorder called the glanders, the most formidable of all to the horse. As the seat of the glanders is in the pituitary membrane, it is consequently a real cold, which occasions an inflammation in this membrane. Travellers too, who give us a detail of the maladies of horses in warm climates, as in Arabia, Persia, and Barbary, do not say that the glanders are

so frequent there as in cold climates. It is from this therefore that the conjecture arises, that this malady is occasioned by the coldness of the water, because these animals are obliged to dip and keep the nose and nostrils a considerable time under it. This, however, might be prevented by never giving it to them cold, and by always wiping the nostrils after drinking. Asses, who fear the cold more than horses, and resemble them so strongly in the interior structure, are, notwithstanding, not so subject to the glanders. This may possibly happen from their drinking in a different manner from horses; for, instead of dipping the mouth and nose deeply into the water, they scarcely touch it with their lips.

I shall not speak of the other diseases of horses. It would extend this Natural History too much to join to the history of an animal that of its disorders: nevertheless, I cannot leave the history of the horse, without regretting that the health of this useful animal should have been hitherto abandoned to the care, and frequently absurd practice, of ignorant people. The branch of physic which the ancients called Veterinarian, is at present scarcely known but by name. Were some physician to direct his views this way, and make this study his principal object, he would soon find it answer his purpose, both with respect to reputation and profit. Instead of degrading himself, he would render his name illustrious; and this branch of physic would not be so conjectural and difficult as the other. All causes being more simple in animals than in man, the diseases ought also to be less complicated, and consequently treated with more success.

THE ASS.

IF we consider this animal with attention, he appears only to be a horse degenerated. The perfect similitude in the conformation of the brain, the lungs, the stomach, the intestinal conduit, the heart, the liver, and other viscera, and the great resemblance of the body, legs, feet, and the entire skeleton, is a sufficient foundation for this opinion. We may even attribute these slight differences which are found between these two animals, to the influence of the climate, food, and the fortuitous succession of many generations of small wild horses, half degenerated, which by little, have still continued to degenerate so far as at last to produce a new and fixed species; or rather, a succession of individuals, all vitiated in the same manner. What appears to favour this notion is, that as horses vary much more than asses in the colour of their skin, they are consequently more anciently domestic, since all domestic animals vary much more in their colour than wild ones of the same species. Besides, the greater number of wild horses, of which travellers

speck, are small in their size, and have, like asses, the coat grey, and the tail naked and frizzled at the end. They also mention wild horses, and even domestic ones, which have a black stripe on the back, and other marks which nearly resemble both wild and domestic asses.

Again, if we consider the difference of the temperament, disposition, the manners, the organism, of these two animals, and, above all, the impossibility of mixing the breed to make one common species, or even an intermediate species which may be renewed, it appears a better-founded opinion, to think that these animals are of a species equally ancient, and originally as different as they are at present. The ass differs materially from the horse, in the smallness of the size, largeness of the head, length of the ears, hardness of the skin, nakedness of the tail, the form of the rump, and also in the dimensions of the neighbouring parts; such as the voice, the appetite, manner of drinking, &c. Do the horse and the ass, then, come originally from the same stock? are they of the same family, or not? and have they not always been different animals?

When two individuals cannot produce together, we can no otherwise account for it, but from a slight difference in their temperament, or some accidental fault in the organs of generation, of one or other of these two individuals. That two individuals of different species, should produce other individuals which do not resemble the one or the other in any fixed particular, and can consequently produce nothing like themselves, there needs but a certain degree of conformity between the form of the body and the organs of generation of these different animals. But what an immense number of combinations are necessary, even to suppose that two animals, male and female, of a certain spe-

cies, are no longer able to produce with those of their own kind, but are even degenerated to such a degree that they can only produce together; and also, what a prodigious immensity of combinations are necessary that the production of these two degenerated animals should follow exactly the same laws which are observed in the production of perfect animals; for a degenerated animal is itself a vitiated production; and how can a vitiated, depraved origin, become a stock, and not only produce a constant succession of beings, but even produce them in the same manner, and following the same laws, which in effect reproduce the animal, the origin of which is pure?

Although we cannot demonstrate that the production of a species, by degeneration, is a thing impossible in nature, yet the number of probabilities on the contrary is so great, that we can no longer doubt of it. For if some species have been produced by the degeneration of others, if the species of the ass is derived from the species of the horse, this can only have happened successively. By degrees, therefore, there would have been, between the horse and the ass, a great number of intermediate animals, the first of which would have differed but slightly in its nature from the horse, and the latter would have approached by degrees to that of the ass. Why then do we not see the representatives, the descendants of the intermediate species? why do only the two extremes remain?

The ass is then an ass, and not a horse degenerated. He is neither a stranger, an intruder, nor a bastard. He has his family, his species, and his rank. His blood is pure; and although his nobility is less illustrious, yet it is equally good, equally ancient with that of the horse. Why, then, have we so much con-

tempt for this animal ; so good, so patient, so steady, so useful ? Do men carry their contempt even to animals, those which serve them so well, and at so small an expense ? We take care of, we instruct, and we exercise the horse, whilst the ass is abandoned to the care of the lowest servant, or the tricks of children. Thus, instead of improving, he must lose by his education ; and if there were not a fund of good qualities, he would certainly lose them by the manner in which he is treated. He is the May game of the rustics, who beat him with staffs, overload him, and make him work beyond his strength. We do not consider, that he would be the most beautiful, the best-formed, and most distinguished of the lower animals, if there were no horses in the world. We forget that he is an ass, that he has all the qualities of his nature, all the gifts attached to his species ; and at the same time, we only think of the figure and qualities of the horse, which he ought not to have.

He is naturally as humble, patient, and quiet, as the horse is proud, ardent, and impetuous. He suffers with constancy, and perhaps with courage, chastisement and blows. He is moderate both as to the quantity and quality of his food. He is contented with the hardest and most disagreeable herbs, which the horse, and other animals, will leave with disdain. He is very delicate with respect to his water, for he will drink none but the clearest, and from rivulets with which he is acquainted. He drinks as moderately as he eats, and does not put his nose in the water (through fear, as some say, of the shadow of his ears). As care is not taken to curry-comb him, he frequently rolls himself on the grass, thistles, and in the dust ; and, without regarding his load, he lays himself down

to roll about as often as he can, and by this seems to reproach his master, for the little care he takes of him.

In his earliest youth, he is sprightly, and even handsome, light, and genteel ; but, either from age or bad treatment, he soon loses it, and becomes slow, indocile, and headstrong. Pliny assures us, that when they separate the mother from the young one, she will go through fire to recover it. The ass is also strongly attached to his master, notwithstanding he is usually ill-treated. He will smell him afar off, and can distinguish him from all other men. He also knows the places where he has lived, and the ways which he has frequented. His eyes are good, and his smell is acute. His ears are excellent, which has also contributed to his being numbered among timid animals, which it is pretended have all the hearing extremely delicate, and the ears long. When he is over-loaded, he shews it by lowering his head, and bending down his ears : when he is greatly abused, he opens his mouth, and draws back his lips in a most disagreeable manner, which gives him an air of derision and scorn. If his eyes are covered over, he remains motionless. He walks, trots, and gallops like the horse ; but all his motions are smaller, and much slower. Notwithstanding he can run with tolerable swiftness, he can gallop but a little way, and whatever paces he uses, if he is hard pressed, he is soon fatigued.

The Jack-ass brays in a very discordant manner. The she-ass has a clearer and shriller voice. Those that are gelded, bray very low ; and, though they seem to make the same efforts, and the same motions of the throat, yet their cry cannot be heard far off.

Of all the animals covered with hair, the ass is least subject to vermin. This circumstance may be

attributed to the hardness and dryness of the skin, which is certainly harder than in the greatest part of other quadrupeds. He is much less sensible than the horse to the whip and the sting of the flies.

At two years and a half old, the first middle incisive teeth fall out, and afterwards the other incisive at the side of the first fall also, and are renewed at the same time and in the same order as those of the horse. The age of the ass is also known by his teeth. The third incisive on each side ascertains it, as in the horse.

The ass is three or four years in growing, and lives twenty-five or thirty years. He sleeps less than the horse, and does not lie down to sleep, except when quite tired.

There are among asses different races, as among horses; but they are much less known, because they have not been reared with the same attention; but we cannot doubt that they came all originally from warm climates. Aristotle assures us, that there were none in his time in Scythia, nor in the other neighbouring countries, nor even in Gaul, which, he says, is a cold climate. He adds too, that a cold climate, either prevents them from procreating their species, or makes them to degenerate; and that this last circumstance is the reason that they are small and weak in Illyria, Thrace, and Epirus. They appear to have come originally from Arabia, and to have passed from Arabia into Egypt, from Egypt into Greece, from Greece into Italy, from Italy into France, and afterwards into Germany, England, and lastly into Sweden, &c. for they are, in fact, weak and small in proportion to the coldness of the climate.

The Latins, after the Greeks, have called the wild ass, *angra*; which animal must not be confounded, as

some naturalists and many travellers have done, with the zebra. The angra, or wild ass, is not striped like the zebra, and is not near so elegant in figure. Wild asses are found in some of the islands of the Archipelago, and particularly in that of Cerigo. There are also many in the deserts of Lybia, and Numidia. They are grey, and run so fast, that the horses of Barbary only outstrip them in the chase. When they see a man, they give a loud cry, turn themselves about, and stop, and do not attempt to fly till he approaches pretty near them. They are taken in snares made with ropes, and go in troops both to pasturage and to drink; their flesh is also eaten. There were also, in the time of Marmol, wild asses in the island of Sardinia, but less than those of Africa; and Pietro della Valle said, he has seen a wild horse at Bassora, whose figure differed in no respect from a domestic one. He was only of a lighter colour, and had, from the head to the tail, a stripe of white; he was also much livelier, and lighter in hunting, than the greater number of asses.

Neither asses nor horses have been found in America, although the climate, especially of North America, is as good for them as any other. Those which the Spaniards have transported from Europe, and which they have left in the West Indies, and on the continent, have greatly multiplied; and in some parts wild asses are found in troops, and are taken in snares like wild horses.

The ass with the mare produces large mules, and the horse with the she-ass produces small mules, differing from the first in many respects.

As wild asses are unknown in these climates, we cannot actually say whether the flesh is good to eat;

but it is certain, that the flesh of the domestic ass is extremely bad, and harder than that of the horse. The milk of the ass, on the contrary, is an approved and specific remedy for certain complaints, and its use is known from the Greeks to us. That it may be good in its kind, we should choose a young healthy she-ass, full of flesh, that has lately foaled, and which has not since that period been with the male. Care must be taken to feed her well with hay, wheat, and grass. The milk must not be exposed to the air, which will spoil it in a short while.

The skin of the ass is used for different purposes, such as to make drums, shoes, and thick parchment for pocket-books, which is slightly varnished over. It is also with the skins of asses that the Orientals make the sagri, which we call shagreen.

The ass is, perhaps, the animal which can carry the greatest weight. As it costs but little to feed him, and as he scarcely requires any care, he is of great use in the country. He also serves to ride on, as all his paces are gentle, and he stumbles less than the horse. He is frequently put to the plough in countries where the earth is light, and his dung is an excellent manure.

THE BULL. *THE COW.*

THE ox,* and other herbivorous animals are not only the most useful to man, but they are also maintained at the least expense. The ox is the most excellent in this respect, for he restores as much to the

* The word Ox, in its common acceptation, denotes Black Cattle in general without regard to sex. In a more restricted sense, it signifies a castrated Bull.

earth as he takes from it, and even enriches the ground on which he feeds.

That the ox is not so proper as the horse, the ass, and the camel, for carrying burthens, the form of his back and loins is a demonstration. But the thickness of his neck, and the broadness of his shoulders point him out as destined for the yoke.

In some places they make him draw by the horns. In support of this practice, it is alledged that when yoked in this manner he is more easily managed. His head is very strong, and he draws well by the horns, but with much less advantage than by the shoulders. Nature seems to have destined him for the plough. The size of his body, the slowness of his motions, the shortness of his legs, and even his tranquillity and patience when he labours, seem to concur in rendering him proper for the cultivation of the fields, and more capable than any other of overcoming the constant resistance that the earth opposes to his efforts.

In those species of animals, which man has formed into flocks, and where the multiplication is the principal object, the female is more useful than the male. The produce of the cow is renewed every instant. The flesh of the calf is wholesome and delicate. The milk is the food of children; butter relishes the most of our dishes, and cheese is the common food of the peasants.

The cow arrives at the age of puberty in eighteen months, and the bull in two years. But they should not be admitted to each other till they be three years old. From three to nine years these animals are in their greatest vigour. After this, neither cows nor bulls are fit for any thing but to fatten for the slaughter, as at two years of age they are almost at their

full growth. The length of their lives is also, like that of the greatest part of the other species of animals, about fourteen years, and they seldom live above fifteen.

The dullest and most idle animals are not those which sleep the soundest, or the longest. The ox sleeps, but his sleep is short, and not very sound; for he awakes at the least noise. He usually lies on his left side, and that kidney is always larger and fatter than the kidney on the right side.

Oxen, like other domestic animals, differ in colour; but at the same time red appears to be the most common, and the redder they are, the more they are esteemed. It is said, that oxen of a bay colour last longest; that those of a brown colour are sooner fatigued, and shorter lived; that the grey, brindled, and white are not proper for work, and only fit to be fattened for slaughter. But whatever colour the coat of the ox is of, it should be shining, thick, and soft to the touch; for if it is rough and uneven, we have reason to think that the animal is not well, or at least, that he is not of a strong constitution.

The ox should only be worked from three years old to ten; and it is proper then to take him from the plough, in order to fatten and sell him, as the flesh will be better than if he be kept longer. The age of this animal is known by his teeth and horns. The first front teeth fall out when he is ten months old, and are replaced by others which are larger and not so white. At sixteen months those on each side of the middle teeth drop out, and are replaced by others; and at three years old all the the incisive teeth are renewed. They are then all long, white, and even; and, in proportion as the ox advances in years, they decay,

and become unequal and black. The horns fall off at three years, and these are replaced by other horns, which, like the second teeth, do not fall off a second time. Those of the ox and the cow grow larger and longer than those of the bull; but the growth of these second horns is not uniform. The fourth year of the age of the ox, two little pointed horns sprout, which are even, and terminate at the head by a kind of knob. The following year this knob grows from the head, pushed out by a cylinder of horn, which forms and terminates also by another knob; for as long as the animal lives, the horns grow. These knobs become annular knobs, which are easily to be distinguished in the horns, and by which also the age may be easily known, by reckoning three years for the first knob next the point of the horn, and one year more for each of the intervals between the other knobs.

The horse eats night and day, slowly, but almost continually. The ox, on the contrary, eats quick, and takes in a short time all the food which he requires; after which he ceases to eat, and lies down to ruminate. This difference arises from the different conformation of the stomachs of these animals. The ox, of whose stomachs the two first form but one bag of a vast capacity, can in both of them receive grass, at the same time which it afterwards ruminates and digests at leisure. The horse, whose stomach is small, and can receive but a small quantity of grass, is filled successively in proportion as he digests it, and it passes into the intestines, where the principal decomposition of the food is performed.

Chewing the cud is but a vomiting without straining, occasioned by the re-action of the first stomach on the food which it contains. The ox fills the two first stomachs, the paunch, and the bag, which is but a por-

tion of the paunch, as much as he can. This membrane acts with force on the grass which it contains; it is chewed but a little, and its quantity is greatly increased by fermentation. Were the food liquid, this force of contraction would occasion it to pass by the third stomach, which only communicates with the other by a narrow conveyance, and cannot admit such dry food, or, at least, can only admit the moister parts. The food must, therefore, necessarily pass up again into the œsophagus, the orifice of which is larger than the orifice of the conduit, and the animal again chews and macerates them, imbibes them afresh with its saliva, and thus by degrees makes the aliment more moist. He reduces it to a paste, liquid enough for it to enter this conduit which passes into the third stomach, where it is again macerated before it enters the fourth; and it is in this last stomach that the decomposition of the hay is finished, which is reduced to a perfect mucilage.

What chiefly confirms the truth of this explication is, that as long as the animals suck, and are fed with milk and other liquid aliments, they do not chew the cud. They chew the cud much more too in winter, when they are fed with dry food, than in summer, when they eat tender grass.

Good milk is neither too thick nor too thin. Its consistence should be such that when we take a drop, it should preserve its roundness without running, and in colour it should be of a beautiful white. That which is inclinable to blue or yellow is not good. Its taste should be sweet, without any bitterness or sourness. It is better during the month of May, and during the summer, than in the winter; and it is never perfectly good but when the cow is of a proper age, and in good

health. The milk of young cows is too thick, that of old ones during the winter is also too thick. The milk of cows which are hot, is not good, any more than that of a cow which is near her time, or which has lately calved. In the third and fourth stomach of the calf which sucks, there are clots of curdled milk. These when dried in the air, serve to make runnet, or that well-known substance which coagulates milk. The longer the runnet is kept, the better it is, and it requires but a small quantity of it to make a great deal of cheese.

Bulls, cows, and oxen, are apt to lick themselves, but mostly when they are quiet; and as it is thought that it hinders them from fattening, it is usual to rub all the parts of their bodies they can touch with their dung. When this precaution is not taken, they raise up the hair of their coats with their tongues, which are very rough, and they swallow this hair in large quantities. As this substance cannot digest, it remains in the stomach, and forms round, smooth balls, which is sometimes of so considerable a size, as to prevent their digestion. These knobs in time get covered with a brown crust, which is somewhat hard. It is, notwithstanding, but a thick mucilage, which, by rubbing and co-action becomes hard and shining. It is never found any where but in the paunch, and if any of the hair gets into the other stomachs, it does not remain, but seems to pass with the aliments.

Animals which have incisive teeth, such as the horse and the ass, in both jaws, bite short grass more easily than those which want incisive teeth in the upper jaw. Hence if the sheep and the goat bite the closest, it is because they are small, and their lips are thin. But the ox, whose lips are thick, can only bite

long grass ; and it is for this reason that they do no harm to the pasture on which they live, as they can only bite off the tops of the young grass. They do not stir the roots, and for this reason scarcely hurt the growth ; instead of which, the sheep and the goat bite so close, that they destroy the stalk and spoil the root. Besides, the horse chooses the most delicate grass, and leaves the largest to grow, the stalks of which are hard. The ox, on the other hand, bites these thick stalks, and by little and little destroys the coarse grass ; so that, at the end of some years, the field on which the horse has lived becomes a very bad one, whilst that on which the ox has broused, becomes fine pasture.

THE RAM. *THE EWE.*

We can no longer doubt, but that animals which are actually domestic, were formerly wild. But man, who has conquered so many millions of individuals, can he boast of having conquered an entire species? As they were all created without his aid, may he not

also believe, that they have had orders to grow without his help? If we consider, nevertheless, the weakness and stupidity of the sheep, and at the same time reflect, that this animal, without defence, cannot find safety in flight; that he has for his enemies all devouring animals, which seem to seek him in preference to any other; that formerly this species produced but few; that each individual lived but a short time; we shall be inclined to think, that from the beginning, sheep were entrusted to the care of man. What seems to give farther strength to this opinion is, that there are no wild sheep in the deserts; that in all places where man does not rule, the lion, the tiger, and the wolf reign by force, and by cruelty; and these animals of blood and carnage, all live longer, and multiply much more than sheep; and, in short, that if we were now to abandon the troops of these species, which we have rendered so numerous, they would soon be destroyed before our eyes, and the species would be entirely annihilated by the voraciousness of its numberless species of enemies.

The sheep is indeed absolutely without resource, and without defence. The ram has but feeble arms; his courage is nothing but a petulance useless to himself, inconvenient to others, and which is destroyed by castration. The weather sheep are still more fearful than ewes; it is through fear that they muster up so often in troops. The smallest noise to which they are unaccustomed, is sufficient to make them fly, and get close together. This fear is attended with the greatest stupidity; for they know not how to fly the danger, nor do they even seem to feel the inconvenience of their situation. They continue wherever they are, either in rain or snow, whence they will not stir;

and to oblige them to change their situation, they must have a chief, who is intrusted to walk first, and whom they will follow step by step. This chief will remain with the rest of the flock, without motion, in the same place, if he were not driven from it by the shepherd, or the dog which guards them, who, in fact, watches for their safety, defends, directs, and separates them, assembles them together, and communicates to them motions not their own. Goats, which in many things resemble sheep, have much more understanding.

But this animal, so cowardly in itself, so destitute in sentiment, is the most precious and the most useful of animals, both for the present and future support of man. Of itself, it not only supplies our greatest necessities, but, at the same time furnishes us both with food and clothing. Without enumerating the particular advantages we have from the milk; the skin, and even the bowels, the bones, and the dung of this animal evince that nature has given it nothing but what is useful to man.

These simple animals, are also of a very weak constitution; for they cannot walk long; travelling weakens and exhausts them; and when they run, they pant, and are soon out of breath. The great heat of the sun is as disagreeable to them, as too much moisture, cold and snow. They are subject to many disorders the greatest part of which are contagious; too much fat sometimes kills them, and always prevents them from having young ones. They suffer a great deal in having young, have frequent abortions, and require more care than any other domestic animal.

At one year old, the sheep lose the two front teeth of the lower jaw; and almost every one knows that they

have no incisive teeth in the upper jaw. At eighteen months old, the two neighbouring teeth of the two first that fell, fall also; and, at three years old, they are replaced. They are then even, and tolerably white; but, in proportion as the animal becomes older, they become uneven and black. The age of the ram is also known by his horns, which shew themselves in the first year, and frequently from the birth. They grow every year a ring, which is a mark round. The sheep have generally no horns; but they have bony prominences on their heads, in the same part where the horns of the rams grow; there are, notwithstanding, some sheep which have two, and even four horns. These sheep are like the others; their horns are five or six inches long, but less turned than those of the ram; and when there are four horns, the two exterior ones are shorter than the two others.

Sheep carry their young five months, and drop them at the beginning of the sixth. They usually produce but one lamb, and sometimes two. In warm climates they may produce twice a year, but in cold climates they produce but once a year.

The sheep has great plenty of milk for five or six months. This milk is tolerable food for children, and for poor people in the country; and they make good cheese with it, especially when it is mixed with cow's milk.

In dry soils, and in high grounds, where wild thyme and other odoriferous herbs abound, the flesh of the sheep is of a much better quality than when it is fed in low plains and humid vallies, unless these plains are sandy and near the sea; for then all the herbs imbibe a saltiness, and the flesh of mutton is no where so good as in these salt meadows. The sheep's milk

is also more abundant, and of a better flavour, as nothing is more pleasing to the taste of these animals than salt, nothing is more salutary for them, when it is given them in moderation ; and in some places, they put into the sheep-pen a bag of salt, or a salt stone, which they will lick by turns.

Nothing contributes more to fatten sheep, than to give them water in great quantity ; and nothing prevents this advantage so much as the heat of the sun.

We frequently find worms in the livers of animals ; and in the *Journal des Savans*, there is a description of worms found in the livers of sheep and oxen, as also in the *German Ephemerides*. One would think that these singular worms were only found in the livers of animals which chew the cud ; but Mr Daubenton has found some, which exactly resemble them, in the liver of the ass ; and it is probable that they may be found in the livers of other animals. It has also been said, that butterflies have been found in the livers of sheep.

The operation of sheep-shearing is performed once a year. In France it is performed in the month of May, after the sheep have been well washed, in order to make the wool as clean as possible. In April it would be too cold ; and if they were to wait till the months of June and July, there would not be time enough for the wool to grow during the summer, to preserve them from the cold in the winter. The wool of ewes is generally better, and in greater abundance than that of rams. That on the neck, and the top of the back, is the best. White wool is preferable to grey, brown, or black, because in dieing it will take any colour. For the quality, that which is smooth is better than that which is frizzled ; it is also said, that

sheep whose wool is frizzled are not so healthy as others. Another considerable advantage may be made of sheep, by inclosing them on the ground we wish to improve. The dung, the urine, and the heat of the bodies of these animals, will, in a little time, enrich the most exhausted, cold, and infertile ground. A hundred sheep, in one summer, will enrich eight acres of land for six years.

The ancients have said, that all animals which chew the cud have tallow ; but this is only true of the sheep and the goat ; and that of the goat is more abundant, whiter, drier, firmer, and of a better quality than any other. It is for the most part about the loins that this suet is amassed in the greatest quantities, and the left loin has always a larger quantity than the right. Sheep have no other fat about them but suet ; and this matter is so predominant in their habit, that all the extremities of the body are edged with it ; even the blood contains a considerable quantity.

The wool of Italy, Spain, and England, is finer than that of France.

Those animals with large, long tails, which are so common in Africa and Asia, and to which travellers have given the name of Barbary sheep, appear to be of a different species from our sheep, as well as the lamb of America.

THE GOAT.

THOUGH the species of animals are separated from each other ; yet some species approach so near to others, that space is only left for a bare line of distinction. The ass might almost replace the horse ; and, if the species of sheep were to fail, that of the goat might supply the loss. The goat, like the sheep, affords both milk and suet in considerable quantities. Her hair, though rougher than wool, serves, however, to make very good stuffs ; and her skin is worth more than the skin of the sheep. The flesh of the young goat also nearly resembles that of the lamb. These auxiliary species are wilder and more robust than the principal species. The ass and the goat do not require so much care as the horse and the sheep ; for they every where find food to support them, and browse equally on plants of all kinds. They are less affected with the intemperance of the climate, and can do better without the help of man. The less dependence they have on us, the more they seem to belong to nature.

Although the goat is a distinct species, yet he will couple with the sheep ; but no intermediate species has been introduced between the goat and the sheep. These two species are distinct, remaining constantly separated, and always at the same distance from each other, and have never been changed by this mixture, or produced any new stock or new breed of intermediate animals. They have, at most, only produced different individuals, which have no influence on the unity of each primitive species, and which, on the contrary, confirms the truth of their different characteristics.

The goat has naturally more understanding, and can shift better for herself than the sheep. She comes voluntarily, and is easily familiarized : she is sensible of caresses, and capable of attachment : she is also stronger, lighter, more agile, and less timid than the sheep : she is lively, capricious, and lascivious.

Goats are fond of straying in solitary places, of climbing up steep places, of sleeping on the tops of rocks, and on the brink of precipices.

The inconstancy of this animal's nature is shewn by the irregularity of her actions ; she walks, stops short, runs, jumps, advances, retreats, shews, then hides herself, or flies, and this all from caprice, or without any other determinate cause than her whimsical vivacity. All the suppleness of the organs, all the nerves of the body, are scarcely sufficient for the petulance and rapidity of these motions, which are all natural to her.

That these animals are naturally fond of mankind, and that in uninhabited places they do not become wild, the following anecdote is a striking confirmation. In 1698, an English vessel having put into harbour at the isle of Bonavista, two negroes presented them-

selves on board, and offered the English as many goats as they choose to take. At the surprise which the captain shewed at this offer, the negroes observed there were but twelve persons in the island ; that the goats multiplied so fast, that they became troublesome ; and that, far from having any trouble in taking them, they followed them with a kind of obstinacy, like domestic animals.

Goats go five months with young, and bring forth at the beginning of the sixth month. They suckle the young ones for about a month or five weeks ; so that it may be reckoned about six-and-twenty weeks from the time of their coupling till the time that the young kid begins to eat. The goat generally produces one kid, sometimes two, very rarely three, and never more than four ; and she brings forth young, from a year or eighteen months, to seven years. The knobs in the horns, and their teeth, ascertain their age. The number of teeth is not always the same in female goats ; but they have generally fewer than the male goat, which has also the hair rougher, and the beard and the horns longer. These animals, like oxen and sheep, have four stomachs, and chew the cud. This species is more diffused than that of the sheep ; goats like ours are found in several parts of the world, only in Guinea, and other warm countries they are smaller ; but in Muscovy, and other cold climates, they are larger. The goats of Angora, and of Syria, have ears hanging down, and are of the same species with ours, They mix and produce together, even in our climate, The males have horns almost as long as the common goat ; but the circumference and directions are very different. They are extended horizontally on each side of the head, and form spirals, somewhat like a

worm. The horns of the female are short, and first turn round backwards, then bend down, and turn round before, so much, that they end near the eyes ; and in some their circumference and direction vary. The male and female goat of Angora, which I have seen, are such as I have described ; and these goats, like all the animals of Syria, have the hair so very long, and thick, and fine, that stuffs have been made of it, almost as handsome and glossy as our silks. It is, in fact, what is commonly termed *mohair*.

THE HOG.

I shall treat of the sow, the hog of Siam, and the wild boar, at the same time, because they form all three but one and the same species ; one is wild, and the other two are domestic.

Aristotle first divided quadrupeds into beasts with the hoof entire, those with cloven feet, and the species which have claws. He allows that the hog is of an ambiguous nature ; but the only reason he gives, is

that in Illyria swine are found which have hoofs, and in some other parts a species which have claws. This animal is also a kind of exception to the two general rules of nature, viz. That the larger animals are, the fewer young they produce at a birth; and that of all animals, those which have claws are the most prolific. The hog, though in its make greatly above the middle size, produces more than any such animal, or indeed, than any other quadruped.

To the singularities we have already related, we shall add another, which is, that the fat of the hog is different from that of almost all other quadrupeds, not only in its consistence and quality, but also in its position in the body of the animal. The fat of man, and of animals which have no tallow such as the dog, the horse, &c. is mixed pretty equally with the flesh. The tallow in the ram, the goat, the stag, &c. is found only in the extremities of it. The fat covers the flesh, and forms a thick, distinct, and continued bed or layer, between the flesh and the skin. The hog has this in common with the whale, and other cetaceous animals, the fat of which is only a kind of lard, nearly of the same consistence with, but more oily than that of the hog. This lard in cetaceous animals also forms beneath the skin a bed of many inches in thickness, which envelopes the flesh.

There are only the hog, and two or three other species of animals, which have defensive or very long canine teeth. They differ from the other teeth, by coming out at the front, and growing during their whole lives. In the elephant and sea-cow, they are cylindrical, and some feet long. In the wild-boar and male hog, they are partly bent in form of a circle; and I have seen them from nine to ten inches in

length. They are not very deep in the socket, and have also, like those of the elephant, a cavity at the superior extremity ; but the elephant and sea-cow have only these defensive teeth in the superior jaw, and even want canine teeth in the inferior jaw. The male hog and the wild boar on the other hand, have them in both jaws, and those of the inferior are the most useful to this animal. These are also the most dangerous ; for it is with these lower tusks the wild boar wounds.

Of all quadrupeds the hog appears the most rough and unpolished. His voraciousness seems to be owing to the incessant avidity he has to fill the vast capaciousness of his stomach. It is the roughness of the hair, the hardness of the skin, and the thickness of the fat, which render these animals so insensible to blows. Mice have been known to lodge in their backs, and eat their fat and their skin, without their seeming sensible of it. Their other senses are good ; and the huntsmen know that wild boars both see, hear and smell at a great distance. In order therefore to surprise them, they wait in silence during the night, and place themselves under the wind, to prevent the boars perceiving their smell, of which they are sensible at a great distance, and which makes them change their road immediately.

This imperfection in the senses of the taste and touch, is still more increased by a distemper which is called the measles, and which renders them almost absolutely insensible. This disorder proceeds in general from the coarseness of their food ; for the wild boar, which usually lives on corn, fruits, acorns, and roots, is not subject to this distemper, any more than the young pig whilst it sucks. This is only to be

prevented by keeping the domestic hog in a clean stable, and giving him plenty of wholesome food. By these means his flesh will become excellent to the taste, and the lard firm and brittle, if he be kept for a fortnight or three weeks before he is killed, in a clean stable without litter, and get no food but dry corn. For this purpose we should choose a sow of about a year old, full of flesh and fat.

The Wild Boar is hunted by dogs, or else taken by surprise in the night by the light of the moon. As he runs but slowly, leaves a strong odour behind him, defends himself against the dogs, and wounds them dangerously, he should not be hunted by dogs designed for the stag and the goat. The oldest only should be attacked, and these are easily known by their traces. A young wild boar, of three years old, is difficult to take, because he runs a great way without stopping. A wild boar that is older, on the other hand, does not run far, suffers himself to be closely hunted, and is not much afraid of the dogs. In the day he usually hides himself in the thickest and most unfrequented parts of the wood, and in the evening and at night he goes out in quest of food. In summer, when the corn is ripe, it is easy to surprise him, particularly among oats, where he frequents every night. As soon as he is killed, the huntsmen immediately cut out the testicles, the smell of which is so strong, that if five or six hours were to elapse without cutting them out, all the flesh would be infected. In an old wild boar the head only is good to eat; but the flesh of the young wild boar is extremely delicate.

Nobody is ignorant of the profits arising from the hog. His flesh sells for more than that of the ox, the lard for double, the blood, the bowels, the viscera,

the feet, and the tongue, when properly prepared, may all be eaten. The dung of the hog is much colder than that of other animals, and should not be used for any but hot and dry lands. The skin hath its use, for sieves are made of it; and brooms, brushes, and pencil-brushes, are made of the hair. The flesh of this animal takes salt and salt-petre better than any other, and will keep longer salted.

This species, though abundant, and greatly spread in Europe, in Africa, and in Asia, was not, however, found on the Continent of the new world: they were transported by the Spaniards, who have carried black hogs to the Continent, and to almost all the large islands of America. They are multiplied and become wild in many places; and resemble our wild boars, with this difference, however, that the body is shorter, the head larger, and the skin thicker. Domestic hogs in warm climates are all black like wild boars.

The Hog of Siam resembles the wild boar more than the common hog. One of the most evident signs of degeneration is the ears, which become much more supple when the animal changes into the domestic state: in short, those of the domestic hog are not near so stiff, are much longer, and more pendant, than those of the wild boar, which should be regarded as the model of the species.

CHAP. VIII.

OF ANOTHER CLASS OF DOMESTIC ANIMALS—THE
DOG—ITS VARIETIES—OF THE CAT, &c.

THE SHEPHERD'S DOG.

THE MASTIFF.

THE GREYHOUND.

THE POINTER.

THE largeness of the make, the elegance of the form, the strength of the body, the freedom of the motions, and all the exterior qualities, are not the noblest properties of an animated being. As in mankind, understanding is preferred to figure, courage to strength

and sentiment to beauty ; so the interior qualities are those which we esteem most in animals. It is in these that they differ from the automaton, it is by these they are raised above the vegetable, and made to approach nearer to ourselves. It is their sense which ennobles their being, which regulates, which enlivens it, which commands the organs, makes the members active, gives birth to desire, and gives to matter progressive motion, will, and life.

The dog, independently of his beauty, vivacity, strength, and swiftness, has all the interior qualities which can attract the regard of man. The tame dog comes crawling to lay at his master's feet his courage, strength, and talents, and waits his orders to use them. He consults, he interrogates, and he beseeches. The glance of his eye is sufficient ; he understands the signs of his will. Without the vices of man, he has all the ardour of sentiment, and, what is more, he has fidelity and constancy in his affections. He has no ambition, no interest, no desire of revenge, no fear but that of displeasing his master. He is all zeal, all warmth, and all obedience. More sensible to the remembrance of benefits than of wrongs, he soon forgets, or only remembers them to make his attachment the stronger. Far from running away, he licks the hand which is the cause of his pain, he only opposes it by his cries, and at length entirely disarms it by his patience and submission.

More docile and flexible than any other animal, the dog is not only instructed in a short time, but he even conforms himself to the motions, manners, and habits of those who command him. He has all the manners of the house where he inhabits. Like the other domestics, he is always attentive to his master ; and,

striving to anticipate the wants of his friends, he gives no attention to indifferent people. When the care of the house is intrusted to him during the night, he becomes sometimes ferocious. He watches, he walks his rounds, he scents strangers afar off; and if they happen to stop, or attempt to break in, he flies to oppose them, and by reiterated barkings, efforts, and cries of passion, he gives the alarm. As furious against men of prey as against devouring animals, he flies upon, wounds, and tears them, and takes from them what they were endeavouring to steal; but, content with having conquered, he rests himself on the spoils, will not touch it even to satisfy his appetite, and at once gives an example of courage, temperance, and fidelity.

Thus we may see of what importance this species is in the order of nature. Without the assistance of the dog, how could man have been able to tame, and reduce into slavery, other animals? How could he have discovered, hunted, and destroyed, wild and obnoxious creatures? To keep himself in safety, and to render himself master of the living universe, it was necessary to begin by making himself friends among animals, in order to oppose them to others. The first art, then, of mankind, was the education of dogs, and the fruit of this art was the conquest and peaceable possession of the earth.

The dog, faithful to man, will always preserve a portion of empire, and a degree of superiority over other animals. He commands them, and reigns himself at the head of a flock, where he makes himself better understood than the voice of the shepherd. Safety, order, and discipline are the fruits of his vigilance and activity. But it is above all in war against

those animals which are his enemies, or which are independent, that his courage shines forth, that his understanding is displayed, and that his natural and acquired talents are united. As soon as the sound of the horn, or the voice of the huntsman, has given the signal of an approaching war, transported with fresh ardour, the dog expresses his joy, and shews by his motions, and cries of impatience, his desire to combat and to conquer. Then, in silence, he investigates the traces of his enemy, and, by different cries, indicates the time, the distance, the species, and even the age of his prey.

In deserts and depopulated countries, there are wild dogs, which in their manner differ only from wolves by the facility with which they are tamed. They unite also in large troops, to hunt and attack by force wild boars and bulls, and even lions and tigers. In America, the wild dogs spring from a breed anciently domestic, having been transported from Europe; and having been either forgotten or abandoned in these deserts, are multiplied to such a degree that they go in troops to inhabited places, where they attack the cattle, and sometimes even insult the inhabitants. They are then obliged to drive them away by force, and to kill them like other ferocious animals; and in fact, dogs are such till they become acquainted with man. When, however, we approach them with gentleness, they soon become familiar, and remain faithfully attached to their masters. The wolf, on the other hand, although taken young, and bred in the house, is only gentle in his youth, for he never loses his desire for prey, and sooner or later he gives himself up to his fondness for rapine and destruction.

The dog is the only animal whose fidelity may be put to the proof. He is the only one which always knows his master and his friends: the only one which perceives the approach of a stranger: the only animal, in short, whose talents are evident, and whose education is always good.

Of all animals, the dog has an understanding most susceptible of impressions, and is most easily taught by moral causes. He is also, above all other creatures, most subject to the variety and other alterations occasioned by physical influences. The temperament, the faculties, and habits of dogs vary prodigiously, and their form is not uniform. In the same country, one dog is very different from another dog, and the species is quite different in itself in different climates.

But what is most difficult to ascertain in the numerous variety of different races, is the character of the primitive and original breed. How are we to know the effects produced by the influence of the climate, food, &c.?

Among domestic animals, the dog is, above all others, that which is most attached to man. He is that in which sentiment predominates enough to render him docile, obedient, and susceptible of all impressions, and even of all constraint. It is not astonishing, therefore, that of all animals this should also be that in which we find the greatest variety, not only in figure, in height, and in colour, but in every other quality.

There are also some circumstances which concur to this change. The dog in general lives but a short time; it produces frequently, and in pretty large numbers; and as it is perpetually beneath the eyes of man, as soon as by a chance usual to nature, there may have

been found among some individuals, singularities, or apparent varieties, endeavours may have been used in order to perpetuate them, by uniting together these singular individuals, as we do at present, when we wish to procure new breeds of dogs, and other animals.

Dogs which have been abandoned in the deserts of America, and have lived wild for a hundred and fifty, or two hundred years, though changed from their original breed when they are sprung of the domestic dogs, have notwithstanding this long space of time retained, at least in part, their primitive form, and travellers report that they resemble our greyhound: these wild dogs, however, are extremely thin and light; and as the greyhound does not differ much from the cur, or from the dog which we call the shepherd's dog, it is natural to think, that these wild dogs are rather of this species, than real greyhounds. Ancient travellers inform us, that the dogs of Canada have the ears straight like foxes, and resemble the middle-sized mastiff, that is, our shepherd's dog, and that those of the deserts of the Aratilles isles, had also the head and ears very long, and are very like foxes.

Besides what we learn from the narratives of travellers, we find that dogs of cold climates have all long snouts and straight ears; that those of Lapland are small, that their ears are straight, and their snouts pointed; that those of Siberia, known by the name of wolf dogs, are larger than those of Lapland; but that they have also the ears straight, the hair rough, and the snout pointed. We learn too that those of Iceland, have also some resemblance to those of Siberia; and that, even in warm climates, such as the Cape of Good Hope, the dogs natural to the countries have sharp snouts, straight ears, the tail dragging on the ground, and the hair shining, but long and frizzled.

We may presume, then, that the shepherd's dog approaches nearest to the primitive races of this species ; for in all countries inhabited by savages, or, at least, by men half-civilized, the dogs resemble this breed more than any other. On the whole continent of the new world, they had no other. In France, where this species is usually called the shepherd's dog, and in other temperate climates, it is still more numerous ; though we are much more occupied in giving birth to, or in multiplying the breeds which are more pleasing, than preserving those which are more useful, and which we have disdained and abandoned to the peasants, who have the care of our flocks.

Dogs are generally produced with their eyes shut : the two eye-lids are not only closed, but adhere by a membrane, which breaks away as soon as the muscle of the upper eye-lid is become strong enough to raise itself, and to overcome this obstacle ; and the greater number of dogs have not their eyes open till the tenth or twelfth day. At this time, the bones of the skull are not finished, the body is puffed out, the snout is swelled, and they have not their proper form ; but in less than a month they learn to make use of all their senses, and begin to have strength and a swift growth. In the fourth month, they get some of their teeth, which all amount to forty-two.

Bitches go with young nine weeks, that is sixty-three days, but never less than sixty. Length of life in dogs is like that of other animals, proportioned to the time required for their growth ; for if they are about two years in growing, they live about fourteen years.

In the Memoirs of the Academy of Sciences, we find the history of a bitch, which having been accidentally left behind in a country-house, subsisted forty days without any other food than the stuff or the

wool of a mattress that she had torn. Water seems to be still more necessary for dogs than food : they drink often, and a great deal at a time ; and it is even a vulgar opinion, that if they want water long, they become mad.

To give a clearer idea of the order of dogs, of their generation in different climates, and of the mixture of their breeds, I subjoin a table, or rather a kind of genealogical tree, in which, with a glance of the eye, all the different varieties of the species may be seen.

The shepherd's dog is the stock or body of the tree : this dog, transported into the rigorous climate of the North, as into Lapland, for example, has become ugly and small. He seems, however, to have been kept up, and even brought to perfection, in Iceland, Russia, and Siberia, where the climate is less rigorous, and where the people are more civilized. These changes have been occasioned by the influence of climate alone, which has produced no great alteration in the form ; for all these dogs have straight ears, long and thick hair, and a wild look.

The same shepherd's dogs, transported into temperate climates, and among people who are quite civilized, such as those of England, France, or Germany, lose their savage air, their straight ears, their long, thick, and rough hair, and become mastiff, hound, or bull-dog, by the influence of climate merely. Of the mastiff, and the bull-dog, the ears are partly straight, or only half-hanging ; and in their manners and sanguinary disposition they resemble the dog from which they drew their origin. The hound is the most distant of the three : the long hanging ears, the docility, gentleness, and, we may say, timidity of this dog, are so many proofs of the great degeneration, or rather

the great perfection, which a long state of subjugation has produced, joined to a careful, and well-followed education.

The hound, the setting dog, and the terrier, are only one and the same race of dogs; for it has been remarked, that the same birth has produced setting-dogs, terriers, and hounds, though the hound bitch has only been covered by one of the three dogs.

The beagle, and almost all sorts of dogs transported into Spain and Barbary, have hair fine, long, and thick, and become spaniels and barbets. The great and little spaniel, which differ only in size, when transported into England, change their colour from black to white, and by the influence of the climate are become large, small, and shabby. To these we may add the terrier, which is but a black beagle, like the other, but with liver-coloured marks on the four feet, the eyes and the snout.

The shepherd's dog, transported to the north, is become a large Dane, and into the south, is become a greyhound: the large greyhounds come from the Levant; those of a middle size from Italy. Greyhounds from the latter of these places, when transported into England, become smaller greyhounds.

The large Danes, transported into Ireland, Ukrain, Tartary, Epirus, and Albany, are become large Irish dogs, and in size surpass all the rest of the species.

The bull dog, transported from England into Denmark, is become a small Dane; and this small Dane, when transported into warm climates, loses its hair entirely, and becomes the naked Turk dog. All these races, with their varieties, have been produced solely by the influence of climate, joined to the effect of their food, and of a careful education: the other dogs are not of a pure race, and come from a mixture of these races.

The greyhound, and the shepherd's dog, have produced the mongrel greyhound, which is called the greyhound with wolf's clothing. Of this mongrel the snout is not so thin as that of the Turkish greyhound, which is very rare in France.

The large Dane, and the large Spaniel, have produced together the dog of Calabria, which is a handsome dog with long, thick hair, and which is taller than the larger mastiff.

The spaniel and terrier produce another kind of dog, which is called the Burgundy spaniel: the spaniel and the little Dane produce the lion dog, which is very scarce.

The dogs with long, fine, and curled hair, which are called dogs of Purgos, and which are of the size of the largest barbets, come from the large spaniel and the barbet.

The little barbet comes from the small spaniel and the barbet.

The bull dog produces, with the mastiff, a mongrel, which is called the strong bull dog, and which is much larger than the real bull dog, and approaches the bull dog more than the mastiff.

The pug comes from the English bull dog, and the little Dane.

All these races are simple mongrels, and come from the mixture of two pure races; but there are also other dogs which may be called double mongrels, because they come from the mixture of a pure race, and of one already mixed.

The shock dog is a double mongrel, which comes from the pug and the small Dane.

The dog of Alicant is also a double mongrel, which comes from the whelp and the little spaniel.

The Maltese, or lap dog, is a double mongrel, and comes from the small spaniel and the barbet.

THE WILD CAT.

THE cat, though an animal of prey, is a useful domestic. It is neither wanting in sagacity nor sentiment; but its attachments are stronger to places than to persons. The form of its body corresponds with its disposition: the cat is handsome, light, adroit, cleanly, and voluptuous: it loves ease, and searches out the softest furniture to lie upon.

Cats go with young fifty-five or fifty-six days: they are not so prolific as dogs, and their usual number is four, five, or six. Young cats are gay, lively, pretty, and would be very proper to amuse children, if the strokes of their paws were not to be feared: their disposition, which is averse to all restraint, renders them incapable of a regular education. We are told nevertheless, of the Greek friars of Cyprus, having taught cats to hunt, take, catch, and destroy the serpents with which that island was infested; their scent, which in the dog is an eminent quality, is far from being good, and therefore they do not pursue animals which they no longer see; but wait and attack them by surprise.

The most immediate physical cause of this inclination, which they have to spy out, and surprise other animals, is owing to the particular conformation of their eyes. The pupil, in man, as well as in the greater part of the lower animals, is capable of a certain degree of contraction and dilatation. It enlarges a little when there is no light, and contracts when the light becomes too strong.

In the eye of a cat, and of nocturnal birds, this contraction and dilatation are so considerable, that the pupil, which in obscurity is large and round, becomes in broad day, long and narrow like a line. For this reason these animals see better during the night than during the day, the form of the pupil being always round when it is not constrained. During the day, there is a continual contraction in the eyes of the cat, and it is only by effort, that he sees in a strong light ; whereas at twilight, the pupil resuming its natural form, he sees perfectly, and avails himself of this advantage in knowing, attacking, and surprising other animals.

Cats seem to have a natural dread of water, cold, and bad smells : they are fond of perfumes, and gladly suffer themselves to be taken and caressed by persons who use them : the scent of Valerian has so powerful an effect on them, that they appear transported by it ; and, in order to preserve this plant in gardens, it is common to surround it with a close fence. Cats will smell it from afar, will run and rub themselves with it, and will pass and repass so often over it, as to destroy it in a short time.

As they are very cleanly, and as their coat is always dry and shining, their hair easily electrifies ; and sparks are seen to come from it, when rubbed with

the hand in any dark place : their eyes shine in the dark, almost like diamonds, and reflect outwardly, during the night, the light which they may be said to have imbibed during the day.

In this climate, we know but one species of the wild cat ; and it appears from the testimony of travellers, that this species is found in almost all climates without any great variety : there were some of them on the continent of the New World before it was discovered. A huntsman carried one which he had found in the woods to Christopher Columbus : this cat was of the common size, the hair of a dark grey, with the tail very long, and very strong : there were some of the same sort of wild cats in Peru, though they had no tame ones ; and there are some in Canada, in the country of the Illinese, &c. They have been seen in several parts of Africa, as in Guinea, at the Gold Coast, at Madagascar, where the original inhabitants had even domestic cats. At the Cape of Good Hope, Kolbe says, there are also some wild cats of a blue colour ; and these blue, or rather slate-coloured cats, are found again in Asia.

In general it may be remarked, that, of all the climates of the inhabited earth, those of Spain and Syria are the most favourable to the beautiful varieties of nature. The sheep, goats, dogs, cats, rabbits, &c. of those countries have the finest wool, the most beautiful and the longest hair, the most agreeable and the most varied colours : the colour of the wild cat, and its hair, like those of most other wild animals, are rather coarse. When tamed, the latter becomes more soft, the former more variegated ; and in the favourable climate of Chorasán and Syria, the latter becomes longer, finer, more copious, the former uniformly soft-

tened ; the black and red changing into a transparent brown, and the dark brown into an ash grey. By comparing a wild cat of our forests with one of those of Chorasan or Syria, we shall find that the only difference between them consists in this shaded variety of colours. As these animals have therefore more or less white upon the belly and the sides, it is easy to conceive, that, in order to have cats intirely white, and with long hair, such as we properly term cats of Angora, we have only to select from this race those which are most white on the belly and the sides, and to unite them together, as is done with rabbits, with dogs, with goats, with stags, with deer, &c. In the province of Pe-chi-ly, in China, there are cats with long hair, and hanging ears, of which the Chinese ladies are exceedingly fond ; these domestic cats with hanging ears of which we do not possess a more ample description, are, no doubt, more remote than those with straight ears, from the race of the wild cat, which, nevertheless, is the original and primitive race of all cats.

CHAP. IX.

OF CERTAIN INTERMEDIATE ANIMALS BETWEEN WILD
AND DOMESTIC.—THE STAG, OR RED DEER—OF
THE FALLOW-DEER, THE ROEBUCK, &c.

THE STAG.

THE Stag is one of those mild, innocent animals, which seem as if they were created solely to adorn and animate the solitude of the forests, and to occupy, remote from man, the peaceful retreats of Nature. His light and elegant form ; his flexible, yet nervous limb ; his head rather adorned, then armed, with a living substance, which, like the branch of a tree, is every year renewed ; his grandeur, his swiftness, his strength,

sufficiently distinguish him from the rest of the inhabitants of the forest.

The old stags shed their horns first, which happens about the end of February, or the beginning of March. Stags in their seventh year do not undergo this change till the middle or the end of March ; nor do those in the sixth year, till the month of April.

After they have shed their horns, they separate from each other ; the very young ones only associating together. They remain no longer in covert ; they seek the beautiful parts of the country, the groves, and the open coppices, where they remain all summer, till they recover the antlers which used to adorn their brows. During this season, they carry their heads low, for fear of striking them against the branches ; for they are exceedingly tender till they arrive at perfection. The horns of the oldest stags are scarcely half repaired by the month of May ; nor do they attain their full length and hardness till about the end of July. The horns of the young stag are very late shed, and very late recovered ; but when they are completely lengthened, and are become quite hard, they rub them against the trees, in order to brush off the scurf with which they are covered.

The hinds, or females, carry their young eight months and a few days : they are not all prolific ; and there is one sort in particular which is always barren : the fawn retains this appellation no longer than till it is six months old ; then the knobs begin to appear, and it takes the name of a knobber, which it bears till these knobs are lengthened to so many points, whence they are termed prickets, or brockets. It does not quit its dam early, though it grows fast, but follows her all the summer. In winter, the hinds, the knobbers, the

prickets, and the young stags, resort to the herd, and form troops, which are numerous in proportion as the season is more severe. In spring they divide, the hinds retiring to bring forth their young; and at this time there is scarcely any but the prickets and the young stags which associate. In general, the stags are inclined to remain with each other, and to roam abroad in companies; and it is only from fear or necessity that they are ever found separated.

The growth of the horns appears to depend on the redundancy of the fluids, and has a near connection with the production of the seminal fluid; for when castrated, the horns of the stag cease to grow.

The beauty of this, as indeed of every part, depends much upon their food; for a stag which lives in a plentiful country, where he feeds at his ease, where he is neither disturbed by men nor dogs, where he may lie down and ruminate in quiet, has always a beautiful head, high, open, palmated, large, and well adorned at top, broad and curled at bottom, with a great number of long and strong antlers. In a country, on the other hand, where he has neither sufficient food nor repose, his head will be in these respects the reverse. Hence it is not difficult to distinguish by the horns of a stag, whether or not he inhabits a fertile or barren country.

The branches which sprout from the head of the stag, in their make and growth, resemble those of a tree: their substance also is, perhaps, more of the nature of wood than of bone. It is, as it were, a vegetable grafted upon an animal, which partakes of the nature of both, and forms one of those shades, by which Nature always approximates two extremes.

The stag passes his whole life in the alternatives of plenitude and want, of corpulence and leanness, of health and sickness, without having his constitution much affected by the violence of the change. Nor is he shorter lived than other animals, which are not subject to such vicissitudes. As he is five or six years in growing, so he generally lives, thirty-five or forty years. What has been reported, therefore, concerning the prodigious longevity of the stag, is without any good foundation, though supported by the story of one which was taken by Charles VI. in the forest of Senlis, with a collar round its neck, whereon was inscribed, "*Cæsar hoc me donavit.*" People choose rather to believe that this animal had lived a thousand years, and had received this collar from a Roman Emperor, than to conclude that he might come from Germany, where the Emperors have always assumed the title of Cæsar.

The horns of the stag continue to increase in bulk and height from the second year to the eighth: they remain beautiful, and much the same, during their vigour of life; but as their body declines with age, so do their horns.

It is but seldom that our stags have more than twenty or twenty-two antlers, even when their head is in its most beautiful state. And, as the size of the stag's head depends on the quantity of his food, so the quality of his horns depends on the quality of it. In fertile countries the quality of the horn is, like the wood of the forest, large, soft, and light; and on the contrary, short, hard, and heavy, in such as are barren.

The most common colour of the stag is yellow, though there are many found of a brown, and many

of a red colour. White stags are much more uncommon and seem to become domestic: the colour of the horns, like that of the hair, depends on the nature and age of the animal, and in general on the impression of the air: the horns of the young stag are whiter than those of the old ones. Of those stags also whose hair is of a light yellow, the horns are often of a sallow hue, and offensive to the eye.

This animal seems to have good eyes, an exquisite smell, and an excellent ear. When he would hearken to any thing, he raises his head, pricks up his ears, and then he hears from a great distance. When he issues from a little coppice, or some other spot half covered, he stops in order to take a full view around him, and then snuffs up the wind, in order to try whether he can discover the scent of any thing that may disturb him. Though naturally simple, he is far from being destitute of curiosity and cunning. If one whistles, or calls aloud to him from a great distance, he instantly stops short, and gazes with fixed attention; but if one has neither arms nor dogs, he passes along without altering his pace. With equal tranquillity and pleasure he seems also to listen to the shepherd's pipe, or flageolet; and the huntsmen, in order to embolden them, sometimes use these instruments. In general, he is much less afraid of men than of dogs, and entertains neither distrust nor artifice, but in proportion as he is disturbed. He eats slowly, chooses his food, and seeks afterwards to repose himself, that he may ruminate at leisure, though not with the same ease as the ox; nor is it without undergoing much violence, that the stag can throw up the food contained in his first stomach. He seldom drinks in the winter, and seldomer still in the spring.

THE FALLOW-DEER.

No two animals can be more nearly allied than the stag and the fallow-deer ; and yet no two animals more eagerly shun each other : they are never seen to herd in the same place : it is even rare, unless they have been transported thither, to find fallow-deer in a country where stags are numerous ; they seem to be less robust and less savage than the stag : they are found but rarely wild in the forests, and are bred up in parks, where they may be considered half domestic.

Of all the countries of Europe, England abounds most in stags : and in this country their flesh is highly valued. It seems to be an animal formed for a temperate climate ; for it is never found in Russia, and very rarely in the forests of Sweden, or in any other northern country. And as the fallow-deer is an animal less savage, more delicate, and it may be added, more domestic than the stag, it is likewise subject to a greater number of varieties. Besides the common deer, and the white deer, there are several other kinds. The deer of Spain, for example, which are almost as large as the stags, but whose neck is

more slender, whose colour is more obscure, and whose tail is rather black than white underneath, and longer than that of the common deer; and the deer of Virginia which are almost as large as those of Spain. Other deer, whose forehead is compressed and flattened between the eyes, whose ears and tail are longer than those of the common deer, and whose hind legs have the hoofs marked with a white spot; and others, which are spotted or streaked with white, black, and yellow; and others still which are entirely black.

The horns of the buck, like those of the stag, are shed every year, and take nearly the same time for repairing.

It frequently happens, that a herd of fallow-deer is seen to divide into parties, and to engage each other with great ardour. They both seem desirous to gain some favourite spot of the park for pasture, and to drive the vanquished party into the coarser and more disagreeable parts. Each of these factions has its particular chief, namely the oldest and the strongest of each herd; these lead on to the engagement; and the rest follow under their direction: their combats are singular enough, from the disposition and conduct by which their mutual efforts seem to be regulated: they attack with ardour, and support the assault with courage: they come to the assistance of each other; they retire, they rally and never yield the victory upon a single defeat. The combat is renewed every day, till at length the more feeble side is obliged to yield, and escape to the most disagreeable part of the park.

From the age of two, till that of fifteen or sixteen, the fallow-deer is in a condition to produce. In short as it resembles the stag in all its natural habits, the greatest difference we find between these two animals is in the duration of their lives. From the testimony

They likewise receive him while they are pregnant, and, by a particular formation of their genitals, are often found to have a super-foetation.

The young ones are brought forth with their eyes open: the dam suckles them for the space of twenty days; after which they leave her, and provide for themselves, they do not part far from each other; yet they live in solitude, and each composes for itself a form, at a little distance. Thus when, we find a young leveret in one place, we are almost sure of finding one or two more in the neighbourhood: they feed more by night than by day; and their favourite articles of food are herbs, roots, leaves, fruit, and grain; but particularly such plants as yield a milky juice: they even eat the bark of trees in winter. When they are reared at home, they are fed with lettuce and roots; but the flesh of these domestic hares has always a bad flavour.

Hares sleep much, but always with their eyes open: they have no eye-lashes, and seem to have but bad eyes: their hearing, however, is exceedingly acute, and their ears are very large compared with the size of their body. They move these long ears with great ease, and use them as a helm, in order to direct their course, which is so rapid, that they outstrip almost every other animal. As their fore legs are much shorter than their hind ones, they can more easily ascend than descend; for which reason, when they are pursued, their first object is to gain, if possible, some mountain: their motion in running is a kind of gallop: they proceed without making any noise, because their feet are plentifully covered with hair; and they perhaps are the only animals which have hair growing within their mouths.

The hare does not live above seven or eight years : they pass their lives in solitude, and in silence ; and they are never known to exert their voice, but when they are forcibly laid hold of, tormented, or wounded : they are by no means so wild as by their habits might be supposed : they are gentle, and susceptible of a species of improvement. As they have a good ear, as they rest on their hind feet of their own accord, and use their fore legs like arms, some have been taught to beat a drum, to gesticulate in cadence, &c.

In general, the hare is not destitute of the instinct necessary for its preservation, nor of sagacity sufficient to effect an escape from its enemies. It prepares for itself a form ; and in winter it chooses a spot which is exposed to the south, as in summer it does one which is situated to the north. It hides itself from view among hillocks of earth which are of the same colour as its hair. “ I have seen,” says Du Foilloux, “ a hare so cunning, that as soon as it heard the huntsman’s horn, it started from its form, and, though at the distance of a quarter of a league from it, leaped to a pond, where it hid itself among the rushes, and thus escaped the pursuit of the dogs. I have seen a hare, which, after having run above two hours before the dogs, has dislodged another hare, and taken possession of its form. I have seen others swim over three ponds, of which the smallest was not less than eighty paces broad. I have seen others, which, after having been warmly chased for two hours, have entered a sheep-cot, through the little opening under the door, and remained among the cattle. I have seen others, when pursued, join a flock of sheep in the field, and remain with them. I have seen others, which, when they heard the dogs, have concealed themselves in the

earth. I have seen others, which have gone along one side of a hedge and returned by the other; so that there was only the thickness of the hedge between the dogs and them. I have seen others, which, after they had been chased for half an hour, have mounted an old wall of six feet height, and taken refuge in a hole covered with ivy."

The nature of the soil has a great influence on these as well as on every other animal. The hares of the mountains are larger and fatter than those of the plains, and they are also of a different colour; the former being browner on the body, and whiter about the neck, than the latter, which are more inclined to red. On high mountains, and in the northern countries, they become white in the winter, and in summer regain their ordinary colour.

THE RABBIT.

THOUGH the hare and the rabbit are externally, as well as internally, very much alike, yet they form two distinct and separate species.

The fecundity of the rabbit is even greater than that of the hare. Without crediting, however, what Wotton has advanced, that one pair being left in an island, produced six thousand in one year, it is certain that these creatures multiply so prodigiously in countries which are proper for the breed, that the earth cannot furnish them with subsistence. They destroy herbs, roots, grain, fruit, and even trees and shrubs; and, were it not for the dog and the ferret, they would reduce the country to a desert. The rabbit not only engenders and produces oftener than the hare, but it

has more ways to escape from its enemies, and to conceal itself from man.

This circumstance alone may suffice to prove, that the rabbit is superior to the hare in point of sagacity. Both are alike in their conformation, and both have it in their power to dig retreats for themselves. Both are timid to an excess; but the one, possessed of less art, is contented with forming for itself a residence on the surface of the earth, where it remains continually exposed. While the other, by a more improved instinct, takes the trouble to dig into the earth for an asylum; and so true is it, but as in this case they act from sentiment, we never see the domestic rabbit employed in the same work.

The domestic rabbits, like all other domestic animals, vary in their colour: white, black, and grey belong properly to Nature. The black rabbits are the most scarce.

These animals are able to engender and produce at the age of five or six months. It is asserted, that they commonly attach themselves to one particular female, and never quit her. She goes with young thirty or thirty-one days, and will produce five, six, and sometimes seven or eight at a birth. Like the doe-bare, she has a double matrix, and of consequence can have in her womb, at the same time, two separate litters. It appears, however, that super-fœtations are less frequent in this species than in that of the hare.

A few days before they bring forth, they dig themselves a fresh burrow, not in a right line, but in a crooked direction, at the bottom of which they make an excavation. After this they tear a quantity of hair from their bellies, and make a kind of bed for the use of their young. For the first two days they never

quit them : they never stir abroad, unless forced by necessity, and they return immediately. At this season they eat much and very quickly ; and thus they tend and suckle their young above six weeks. Till after this period, the buck does not make his advances to the doe. Often, even when she quits the burrow and leaves her young behind, she stops up the entry to it with earth, diluted with her urine ; but when they begin to venture to the edge of the hole, and to eat groundsel and other herbs which the doe picks out for them, the buck begins to take them between his paws, to endeavour to give a gloss to their hair, to lick their eyes ; and all of them, in their turn, partake equally of his care.

A gentleman in my neighbourhood, who had amused himself with raising rabbits for many years, has favoured me with the following remarks :

“ I began,” said he, “ with only one male and one female, the former white, the latter grey ; and of their produce, which was very numerous, the greatest part were grey, a good number of them white, and of a mixed colour, and some few black. These animals seem to have a great respect for paternal authority ; at least I judged so, from the great deference which all my rabbits shewed for their first ancestor, whom I can always easily distinguish by his whiteness, and who is indeed the only male of that colour which I have preserved. It was to no purpose the family increased. Those which in their turn became fathers, were still subordinate to him. Whenever they fought, whether on account of their females, or concerning their food, their great progenitor would run to the place of dispute with all speed, as soon as he heard the noise. No sooner did they perceive him, than every thing

was presently reduced to order ; and if he surprised any one of them actually assaulting another, he used to separate him from the rest, and punish him upon the spot. Another proof of his dominion over all his posterity is, that they were accustomed to return at a whistle. Whenever I gave the signal, how distant soever they might be, this old one immediately put himself at their head ; and though he came first, yet he made them all file off, and enter before him.

CHAP. XI.

OF CARNIVOROUS ANIMALS—THE WOLF—THE FOX—
THE BADGER—THE OTTER—THE MARTIN—THE
PINE-WEASEL—THE POLE-CAT—THE FER-
RET—THE WEASEL—THE ERMINE.

ANIMALS which have but one stomach, and whose intestines are short, are forced, like man, to feed on flesh. Of this affinity, and of this truth, we shall procure certain information by a relative comparison of the size of the intestinal canal in carnivorous animals, and in those that live solely on herbage. We shall then find, that the difference in the manner of living depends solely on the difference in their conformation, and that their nourishment is more or less solid, as the receptacle for it is more or less capacious.

Hence, however, we must not conclude that those animals which live solely on herbage are, from physical necessity, as carnivorous animals are with respect to flesh absolutely confined to one kind of food. It is not meant that they might not use animal food, or that if Nature had furnished them with arms, not only for the purposes of self-defence, but for those of attack

and rapine, they would not have exerted them ; since we find that sheep, calves, goats, horses, greedily eat milk and eggs, which are animal food, and that, unaided by custom, they do not refuse meat which has been hashed and seasoned with salt.

We need not therefore scruple to conclude, that the generally predominant appetite of animals is for flesh and other solid food, and that this appetite is more or less vehement, more or less moderate, according to the particular conformation of each animal. For on taking a full view of Nature, we find it not only in man, but in quadruped animals, in fishes, and even in insects, and in worms.

THE WOLF.

THE wolf is one of those animals whose appetite for animal food is the most vehement, and whose means of satisfying this appetite are the most various. Nature has furnished him with strength, with cunning, with agility, with all those requisites, in a word,

which fit an animal for pursuing, overtaking, and conquering its prey. Notwithstanding all these, he most frequently dies of hunger ; for he is the declared enemy of man. Being long proscribed, and a reward offered for his head, he is obliged to fly from the habitations of men, and to live in the forest. When pressed with hunger, however, he braves danger, and comes to attack those animals which are under the protection of man, particularly such as lambs, sheep, or even dogs themselves. If this excursion has succeeded, he often returns to the charge, till having been wounded, or closely pursued by the dogs or the shepherds he hides himself by day in the thickest coverts, and for a while, only ventures out at night. At last, however when his necessities are very urgent, he boldly faces certain destruction. He attacks women and children ; sometimes ventures even to fall upon men, and becomes furious by his continual agitations.

The wolf, as well externally as internally, so nearly resembles the dog, that he seems modelled upon the same plan ; and yet he only presents us with the reverse of the image. If his form be similar, his nature is, however, different ; and indeed they are so dissimilar in their dispositions, that no two animals can have a more perfect antipathy to each other. A young dog shudders at the sight of a wolf ; a dog who is stronger, and who knows his strength, bristles up at the sight, testifies his animosity, attacks him with courage, endeavours to put him to flight, and exerts his utmost efforts to rid himself of so hateful a creature. They never meet without flying from, or fighting with each other. If the wolf is stronger, he tears and devours his prey. The dog on the contrary, is more generous, and contents himself with his victory.

The dog, even in his savage state, is not cruel ; he is easily tamed, and continues firmly attached to his master. The wolf, when taken young, becomes tame but never affectionate. Nature is stronger in him than education ; he resumes, with age, his natural dispositions, and embraces the first opportunity to return to his native woods. Dogs, even of the dullest kinds seek the company of other animals, and they are naturally disposed to follow and accompany them. The wolf on the contrary, is the enemy of all society, nor does he keep much company even with those of his kind. When they are seen in packs together, it is not to be considered as a peaceful society, but a combination for war. They testify their hostile intentions by their loud howlings, and by their fierceness discover a project for attacking some great animal, such as a stag or a bull, or for destroying some formidable dog. The instant their military expedition is completed, their society is at an end. They then part, and each returns in silence to his solitary retreat. There is not even any strong attachment between the male and female ; they seek each other only once a year, and remain but a few days together.

The difference in the duration of the pregnancy of the she-wolf, who goes with young above an hundred days, and the bitch, who does not go above sixty, proves that the wolf and the dog, so different in disposition, are still more so in one of the principal functions of the animal economy.

The wolf generally brings forth five or six, and sometimes even nine at a litter. The cubs are brought forth, like those of the bitch, with the eyes closed. The dam suckles them for some weeks, and teaches them occasionally to eat flesh, which she prepares for

them, by chewing it first herself. They do not leave the den where they have been littered, till they are six weeks or two months old. It is not, however, till they are about ten or twelve months old, and till they have shed their first teeth and completed the new, that the dam thinks them in a capacity to shift for themselves. Whenever they have acquired arms from nature, and have learned industry and courage from her example, she declines all future care of them, and is again engaged in rearing a new progeny. These animals require two or three years for their growth, and live to the age of fifteen or twenty.

The wolf grows grey as he grows old, and his teeth wear, like those of most other animals. He sleeps when his belly is full, or when he is fatigued, rather by day than night, and is always very easily awaked. He drinks frequently; and in times of drought, when there is no water to be found in the trunks of old trees, or in the pools about the forest, he often visits the brooks or lakes in the plain. Although very voracious, he supports hunger for a long time, and often lives four or five days without food, provided he is supplied with water.

The wolf has great strength, particularly in his fore parts, in the muscles of his neck and jaws. 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. Hence nothing but the dogs can overtake, or oblige him to quit his prey. He bites cruelly, and always with greater vehemence in proportion as he is less resisted; for he uses precautions with such animals as attempt to stand upon the defensive. He is cowardly, and never fights but when under a necessity of satisfying his hunger, or of mak-

ing good his retreat. When he is wounded by a bullet, he is heard to howl; and yet, when surrounded by the peasants, and attacked with clubs, he never howls, but defends himself, in silence, to the last.

If he happens to be caught in a pit-fall, he is for some time so astonished, that he may be killed without offering to resist, or taken alive without much danger. At that instant, one may clap a collar round his neck, muzzle him, and drag him along, without his ever betraying the least symptom of anger or resentment. At all other times he has senses in great perfection. He smells a carcase at the distance of more than a league. He also perceives living animals a great way off, and follows them a long time upon the scent. Whenever he leaves the wood, he always takes care to go out against the wind. No sooner does he arrive at its extremity, than he stops to examine, by his smell, on all sides, the emanations that may come either from his enemy or his prey, which he very nicely distinguishes. He prefers those animals which he kills himself to those he finds dead; and yet he does not disdain these, though ever so much infected, when no better is to be had. He is particularly fond of human flesh; and, perhaps, if he had it in his power, he would eat no other. Wolves have been seen following armies, and arriving in numbers upon the field of battle, where they devoured such dead bodies as were left upon the field, or but carelessly buried. These, when once accustomed to human flesh, seek particularly to attack mankind, prefer the shepherd to his flock, and devour women, and carry off children. These dreadful wolves are called *ware-wolves*, that is, wolves of which we ought to be *aware*.

The colour of this animal differs according to the different climates in which it is bred, and often changes even in the same country. Beside the common wolves which are found in France and Germany, there are others with thicker hair, inclining to yellow. In the northern climates, some are found quite black, and some entirely white. The former are larger and stronger than those of any other kind.

THE FOX.

THIS animal has always been famous for his artifices; and the reputation he has thus acquired, he partly merits. What the wolf cannot accomplish but by his superior strength, the fox accomplishes by his superior cunning. Without attempting to oppose either the shepherd, his dog, or his flock, he finds an easier way to subsist. Patient and prudent, he waits the opportunity for depredation, and varies his conduct as he perceives that circumstances vary. Though as indefatigable and more nimble than the wolf, he does not trust entirely to the swiftness of his course, but

contrives for himself an asylum, to which he retires in cases of necessity, and in which, sheltered from danger, he brings up his young.

The fox generally fixes his residence at the edge of a wood, and yet not far removed from some cottage, or some hamlet. He listens to the crowing of the cock, and the cackling of other domestic fowls. Even at a considerable distance he scents them, and seizes his opportunity. If he be able to get into the yard, he begins by levelling all the poultry without remorse. After this, he carries off a part of the spoil, hides it at some convenient distance, and again returns to the charge. Taking off another fowl in the same manner he hides that also, though not in the same place; and in this manner perseveres, till, warned by the approach of day, or the noise of the family, he finally retires. He practises the same arts when he finds birds entangled in springs laid for them by the fowler, whom the fox anticipating, very expertly snatches the birds out of the snare, conceals them in different places, leaves them there sometimes for two or three days, and is never at a loss to recover his hidden treasure. He is equally alert in seizing the young hares and rabbits, before they have strength to escape him; and when the old ones are wounded and fatigued, he is sure to seize them in the moments of distress. In the same manner he finds out the nests of the partridge and the quail, and seizes the dam while sitting.

The fox is so voracious, that when he has no better food, he devours rats, mice, lizards, toads, and serpents. Insects and shell-fish sometimes serve him for food. In vain does the hedge-hog roll itself up into a ball to oppose him. The wasp and the wild bee are attacked by him with equal success. Though at first

they fly out upon their invader, and actually oblige him to retire, yet this repulse is but for a few minutes till he has rolled himself upon the ground, and thus crushed such as may have stuck to his skin. He then returns to the charge, and at length, by dint of perseverance, obliges them to abandon their combs which he greedily devours.

The young foxes are produced blind, like dogs. Like them too, they are eighteen months or two years in reaching their full growth, and live about thirteen or fourteen years. The senses of the fox are as good as those of the wolf; his sentiment is more acute, and the organ of his voice is more supple, and more perfect. The wolf is never heard but by dreadful howls, while the fox only yelps, barks, and sends forth a moanful sound, resembling the cry of the peacock. His tones, too, are different, according to the different sentiments with which he is affected. He has one sound expressive of desire, a second of murmur, a third of sorrow, and a fourth of pain. The latter is never heard from him, unless in the instant that he is wounded by a shot, and has lost the use of some member; for, like the wolf, when attacked with cudgels alone, he never murmurs, but will defend himself with obstinacy, and fight in silence to the last. He bites dangerously, and with such determined fury, that in order to make him relinquish his hold, ponderous wood and even iron bars are necessary.

The flesh of the fox is not so bad as the flesh of the wolf. Dogs, and even men eat it in autumn, especially if the animal has fed on grapes; and in winter good furs are made of his skin. He sleeps so sound, that however closely approached, there is no great danger of awaking him. When he only means to rest

himself, he stretches out his hind legs, and remains flat upon his belly. In this posture he watches for the birds as they perch on the hedges; who no sooner perceive him than they give each other warning of their danger. The jackdaw and the magpie, in particular, often follow him to the distance of some hundred paces, still towering beyond his reach, and with their cries and notes of hostility, apprize other animals to beware.

Of all wild animals, the fox is most subjected to the influence of climate; and there are found nearly as many varieties in this species as in that of any domestic animal. The generality of the French foxes are red; of some, however, the hair is of a greyish cast; and of all, the tip of the tail is white. In the northern countries we find foxes of all colours.

THE BADGER.

THE Badger is a lazy, distrustful, solitary animal, that retires far from the approach of man, and digs a subterranean residence, where it spends at least three

fourths of its existence, and never ventures forth but in search of food. It burrows in the ground with particular ease, as its body is rather of an oblong form, and its claws, those especially of the fore feet, are long and compact. The hole which it thus forms to itself, is often at a very great distance from the surface of the earth, and the passage to it is always oblique and winding.

The fox, who is less expert at such excavations, often appropriates to his own convenience the labours of the badger. Unable to compel him from his retreat by force, he often expels him by stratagem, often remains a fixed centinel at the mouth of the passage, and, as an infallible expedient, it is said, emits his ordure. When the badger has left it, he immediately takes possession of it, enlarges it, and accommodates it to his own purpose. Though forced to remove to another habitation, this animal does not remove to another country. At a little distance from its old burrow, it forms a new one, from which it never stirs but at night. The dogs easily overtake it, when it is at any distance from its hole; and then, exerting all its strength, all its powers of resistance, it throws itself upon its back, and defends itself with desperate resolution.

Several badgers have been brought to me, and some of them I kept a long time; the young ones are easily tamed; they will play with young dogs, and, like them, will follow any person whom they know, and and from whom they receive their food; but the old ones, in spite of every effort, still remain wild. They are neither mischievous nor voracious, as the fox and wolf are, yet they are carnivorous; and though raw meat is their favourite food, yet they will eat any

thing that comes in their way : they sleep the greatest part of their time, without, however, being subject, like the mountain-rat, or the dormouse, to a torpor during the winter. Hence though they feed moderately, they are always fat.

They keep their hole exceedingly clean, nor are they ever known to void their ordure in it : the male is rarely to be found with the female.

In summer she brings forth, and her usual number is three or four at a birth ; these she feeds at first with her milk, and afterwards with such petty prey as she can surprise. She seizes young rabbits in the warren, robs birds of their young, finds out where the wild bees have laid up their honey, where field-mice, lizards, serpents, and grass-hoppers, are to be met with, and carries all to her expecting brood, which she frequently brings forward to the mouth of her hole.

These animals are naturally of a chilly temperament : such as are reared in a house seem never more happy than when near a fire : they are likewise very subject to the mange ; and, unless carefully washed, the dogs that penetrate into their burrows are infected with the same distemper.

The hair of the badger is always filthy ; between the anus and the tail there is an opening, which, though it has no communication with any interior part, and is hardly an inch deep, continually emits an oily liquid : this the animal is fond of sucking. Its flesh is not absolutely nauseous ; and of its skin are made coarse furs, collars for dogs, trappings for horses, &c.

THE OTTER.

THE otter is a voracious animal, which, more fond of fish than of flesh, is seldom found but at the sides of lakes and rivers. It swims with more facility than even the beaver. All the feet of the otter have membranes; and it can hardly walk faster than it swims.

Accurately considered, the otter cannot be pronounced an amphibious animal. We even find them drowned when they happen to be entangled in a net; and this evidently for want of having had time to destroy it, and thereby effect their escape. For want of fish, frogs, water-rats, or other nourishment, it will eat the young branches, and the bark of aquatic trees; and in spring it will eat new grass. Of cold it is as little afraid as of moisture. It brings forth in the month of March: three or four is the number generally produced at a birth.

The otter becomes industrious with age, and wages a successful war against the tribes of fishes, which, with respect to instinct and sentiment, are greatly in-

ferior to other animals. It does not dig its own habitation, but fixes its residence in the first hole that offers, under the root of the willow or poplar-tree, in the clefts of rocks, and even among piles of floating wood; and there the female brings forth her young: it, however, frequently changes its residence; and disperses its young ones at the end of six weeks, or two months.

THE MARTIN.

THE generality of naturalists have considered the martin and the pine-weasel as animals of the same species: they are, however, different both in disposition and temperament: the pine-weasel shuns open countries, confines itself to the bosom of the forest, fixes its residence upon some tree, and is never found in great numbers but in cold climates: the martin, on the other hand, not only approaches human habitations but even forms a residence for itself in old buildings, in hay-lofts, or in holes of walls; and while the species is generally diffused in great numbers over the temper-

ate climates, it is not to be met with even in the regions of the North.

The countenance of the martin is very sharp ; its eye is lively, its limbs are supple, its body is flexible, and all its movements are quick. It rather leaps and bounds than walks ; and with great facility climbs walls, enters pigeon-houses, and hen-houses, devours the eggs, the pigeons, and the hens, as on other occasions it does mice, rats, moles, and birds in their nests.

This animal is said to bring forth as often as the cat : the growth of the young ones is very quick ; and hence it may be inferred, that it is an animal whose life does not exceed eight or ten years. Its smell, which is not absolutely disagreeable, is like that of counterfeit musk. Both the martin and the pine-weasel, as well as a number of other animals, have interior vesicles which contain a strong-scented substance like that of civet.

THE PINE-WEASEL.

THE pine-weasel is originally a native of the north and is in a manner peculiar to that climate, where they are so numerous, that the quantity of furs produced from them, and carried into foreign countries, is astonishing. In temperate climates, on the contrary it is rarely, and in warm climates never to be found : there are some in Burgundy, and some in the forest of Fontainbleau ; but in general they are as scarce in France as the martin is common : there are none in England, because in that country there are no very extensive woods.

Alike averse to open countries, and to countries which, are inhabited, it remains in the bosom of some forest, ranges through the labyrinths of the thicket, or towers aloft upon the branches of the trees. It subsists by the chase, and destroys a prodigious quantity of birds. Of the squirrel, the dor-mouse, &c. it also makes a prey ; and it is known to eat honey as well as the martin.

Its neck is yellow, whereas that of the martin is white ; and its hair, at the same time, is much finer, thicker, and less subject to shed.

When the female is near her time, her custom is to climb to the nest of some squirrel, to drive her from it, to enlarge it for her own purpose, and to bring forth her young in it. In the same manner, she occupies the old nests of the owl and the buzzard as also the hollow places of trees, from which she presently dislodges the wood-pecker, and other birds.

THE POLE-CAT.

THE pole-cat is somewhat smaller than the martin : its tail is shorter, its snout sharper, and its hair thicker and blacker : it has some white on its forehead, and about the nose and mouth : it differs likewise in its voice ; the cry of the martin being rather sharp and loud, that of the pole-cat deeper and more hollow : the pole-cat, however, does not at all resemble the martin in smell, which in the former is perfectly fetid. When heated or enraged especially, it emits a stench that is absolutely intolerable. The dogs will not eat its flesh ; and even its skin, though good in itself, sells at a very low price, as it can never be entirely divested of its natural odour

THE FERRET.

It has been doubted by some whether or not the ferret and the pole-cat were animals of two different species. Perhaps, the resemblance there sometimes is in the colour of their hair first gave rise to this doubt: the pole-cat, nevertheless, a native of temperate climates, is an animal wild like the martin; whereas the ferret, originally an inhabitant of hot countries, cannot exist in France, unless as a domestic animal. The ferret also, and not the pole-cat, is made choice of to drive the rabbits from their burrows, chiefly because it is more easily tamed. The ferret has a longer and thinner body, a narrower head, and a sharper snout than the pole-cat. It has not the same sagacity in providing for its subsistence; it cannot exist, at least in our regions, without the care of man, nor have such of the species as have been lost in the burrows of rabbits been ever known to multiply in the country; but have, on the contrary, perished to all appearance by the severity of the winter.

This animal is an enemy to the rabbit. If even a dead one is presented to a young ferret which had never seen one before, it springs at it, and tears it with fury: if it be a living one, it seizes it by the neck and nose, and instantly begins to suck its blood. When the ferret is let loose into the burrows of the rabbits, it is necessary to muzzle him, that he may not kill them, but only make them to run out, and thereby fall into the net laid for them at the entry. If he is allowed to go unmuzzled, there is a risque of loosing him, because after having sucked the blood of the rabbit, he will fall asleep. Besides, the smoke which is raised at the mouth of the burrow does not always

prove a sufficient expedient for bringing him back, as there are often more issues than one, and one burrow generally communicates with others.

THE WEASEL.

THE common weasel is as frequent in temperate and in hot countries, as it is rare in cold ones. Though of the same species, it is in many respects different from the ermine, which is a native of the north.

When a weasel enters a hen-roost, it never meddles with the cocks or the old hens. It makes choice of the pullets, the young chickens, all of which he kills with a single stroke on the head, and carries away one after another. It also destroys the eggs, and sucks them with incredible avidity. In winter it generally resides in some granary, or hay-loft; where the female often continues even in the spring, in order to bring forth her young among the hay or straw. During this time the weasel makes war with the rats and mice with more success than the cat; for it follows them into all their holes, and prevents their escape. It also climbs up to the pigeon-houses, to the nests of sparrows, &c. and commits great havock. In summer it

removes to some distance from the houses, always choosing the lower countries about the mills and streams hiding itself among the bushes, in order to catch birds and not unfrequently taking up its habitation in the hollow of an old willow. The female generally brings forth four or five. The young ones come forth with their eyes shut, but in a little time they attain a sufficiency of growth and strength to follow their dam to the chase. They attack adders, water rats, moles, field-mice, &c. and, traversing the meadows, devour quails and their eggs.

Like the pole-cat and the ferret, these animals have so strong a scent that they cannot be kept in any place that is inhabited. As their own smell is very bad, they seem to sustain no inconvenience from any foreign stench or infection. A peasant in my neighbourhood took, one day, three weasels newly brought forth, in the carcase of a wolf which had been suspended by its hind-legs from one of the branches of a tree; and though the wolf was almost entirely rotten, the old weasel brought grass, straw, and leaves, in order to make a bed for her young ones in the cavity of the thorax.

THE ERMINE, OR STOAT.

THE weasel with a black tail is called the ermine when it is white, and the stoat when it is red or yellowish. Though it is a less common animal than the weasel, yet there are numbers to be found in the old forests, and sometimes during the winter in the neighbourhood of woody grounds. It is always easy to distinguish it from the common weasel, because the tip of its tail is always of a deep black, while the edge of its ears, and the extremities of its feet are white.

CHAP. XII.

OF CERTAIN SMALLER ANIMALS OF THE CARNIVOROUS
CLASS—THE SQUIRREL—THE RAT—THE MOUSE—
THE LONG-TAILED FIELD MOUSE—THE WATER
RAT--THE SHORT-TAILED FIELD MOUSE--THE
GUINEA-PIG--THE HEDGE-HOG--THE SHREW-
MOUSE--THE WATER SHREW--MOUSE--THE
MOLE--THE BAT--THE FAT SQUIRREL--
THE GARDEN-SQUIRREL, OR GREAT-
ER DORMOUSE--THE DORMOUSE--
THE BROWN RAT--THE MARMOT.

THE SQUIRREL.

THE Squirrel is a beautiful little animal, which is only half-wild, and which, by its gentleness, its docility, and even the innocence of its manners, might deserve to be exempted from the present class. It is neither a carnivorous nor an injurious animal, though it sometimes seizes on birds; its general food consisting of fruit, almonds, hazle-nuts, beech-mast, and

acorns. It is neat, cleanly, alert, lively, and industrious. Its eyes are full of fire, its countenance is sharp, its body its nervous, and its limbs are supple.

The beauty of its form is farther embellished by a spreading tail, in shape like a plume of feathers, which it raises above its head, and forms into a kind of shade for itself.

The squirrel may be said to be less a quadruped than almost any other four-footed animal. It generally holds itself almost upright, using its fore-feet as hands for a conveyance to its mouth. Instead of hiding itself in the earth, it is continually in the air. It somewhat resembles the birds by its lightness and activity; like them, it rests upon the branches of trees; leaping from one to the other, and in the highest of them builds its nest. It avoids the water still more than the earth; and it is even asserted of this animal, that when it is obliged to cross a river or stream, it uses the bark of a tree, or some such light woody substance, as a boat, while its tail supplies the place of sails, and of a rudder. It collects a quantity of nuts during the summer, which it deposits in the hollow part of some old tree, and to which it has recourse for provision in winter; and such is the agility of its body, that it will in an instant climb the most smooth beech tree.

There are many species which approach to that of the squirrel, though there are few varieties in the species itself. There are some of an ash-colour, and all the rest are red. The small grey squirrel is of a different species, and remains always grey. The flying squirrels are very different from the rest. The white squirrel of Cambaye is very small, and has a tail like that of the European squirrel. That of Madagascar, called *Tsitsihi*, is grey, and according to Flaccourt is

neither handsome nor fit to be tamed. The white squirrel of Siam; the grey, and spotted squirrel of Bengal; the streaked squirrel of Canada; the black squirrel; the large grey Virginian squirrel; the white striped squirrel of New Spain; the white Siberian squirrel; the variegated squirrel; the little American squirrel; that of Brazil; that of Barbary; the *palmist*, &c. form so many species distinct from that which we have described.

THE RAT.

If we descend by degrees from the great to the small, from the strong to the weak, we shall find, that Nature, attentive only to the preservation of each species, creates a profusion of individuals, and is supported by the numbers which she has formed of a diminutive size, and to which she has denied weapons, strength, and courage.

Under the generical name of rat, several species of small animals have been comprised. This name we shall solely appropriate to the common rat, which is of a dark colour, and infects our houses. Each of the other species shall have its particular denomination; for as neither of them couple together, each is different from all the rest.

This animal is carnivorous, and we may use the expression *omnivorous*. Hard substances, however, it prefers to soft ones. It devours wool, stuffs, and furniture of all sorts; eats through wood, makes hiding-places in walls, from whence it sallies forth in quest of prey, and frequently returns with as much as it is able to drag along with it, forming, especially when it has young ones to provide for, a magazine of the whole. The females bring forth several times in the year, though mostly in the summer season; and they usually produce five or six at a birth.

In defiance of the cats, and notwithstanding the poison, the traps, and every other method that is used in destroying these creatures, they multiply so fast as frequently to do considerable damage. In old houses, in the country especially, where great quantities of corn are kept, and where the neighbouring barns and hay-stacks favour their retreat, as well as their multiplication, they would often become dangerously numerous, were they not to devour each other. This we have often found to be the case when they have been straitened for provisions; and the method they take to lessen their numbers, is for the stronger to dispatch the weaker. After this, they lay open their skulls, and first eat up the brains, and afterwards the rest of the body. Next day hostilities are renewed in the same manner; nor do they suspend their havoc till the majority are destroyed. Hence it is, that after any place has for a long time been infested with rats, they often seem to disappear of a sudden, and sometimes for a considerable while.

The female always prepares a bed for her young, and provides them immediately with food. On their first quitting the hole, she watches over, defends, and

will even fight the cats in order to protect them. The weasel, though a smaller animal is, however, a still more formidable enemy than the cat. The rat cannot inflict any wounds but by snatches, and with its fore-teeth, which, however, being rather calculated for gnawing than for biting, having but little strength. The weasel, on the other hand, bites fiercely with the force of its whole jaw at once, and, instead of letting go its hold, sucks the blood through the wound. In every conflict with an enemy so dangerous, it is no wonder, therefore, that the rat should fall a victim.

There are many varieties in this species. Besides the common black rat, there are some which are brown, and some almost black ; some which are grey, inclining to white or red, and some perfectly white. The white rat, like the white mouse, the white rabbit, and all other animals which are entirely of that colour, has red eyes. The white species, with all its varieties, appears to belong to the temperate climates of our continent, and are found in greater numbers in hot countries than in cold ones. Originally they had no rats in America ; and those which are to be found there at present, are the produce of rats which accidentally obtained a footing on the other side of the Atlantic with the first European settlers. Of these the increase was so great, that the rat was long considered as the pest of the colonies ; where, indeed, it had hardly an enemy to oppose it but the large adder, which swallows it up alive. The European ships have likewise carried these animals to the East Indies, into all the islands of the Indian Archipelago, as well as into Africa, where they are found in great numbers. In the North, on the contrary, they have hardly mul-

tiplied beyond Sweden ; and those which are called Norwegian and Lapland rats, are animals different from ours.

THE MOUSE.

THE mouse is an animal smaller than the rat. Its instinct, its temperament, its disposition is the same ; nor does it materially differ from the rat, but by its weakness, and the habits which it contracts from that circumstance. By nature timid, by necessity familiar, its *fears* and its *wants* are the sole springs of its actions. It never leaves its hiding-place but to seek for food ; nor does it, like the rat, migrate from one house to another, unless compelled by necessity. Its manners are milder ; and, to a certain degree it may be tamed. It is, however, utterly incapable of attachment.

If it were not its immense fecundity, the species of the mouse could not subsist. Even in mouse-traps I have known them to bring forth. They produce at all seasons, and several times in the year. Their usual number at a birth is five or six, which, in less than fifteen days attain strength sufficient to shift for them-

selves. As in these respects they so soon attain perfection, so the duration of their life must be very short; a circumstance which cannot but heighten our idea of their prodigious multiplication. Aristotle tells us that having put a pregnant mouse into a vessel of corn, he soon after found in it one hundred and twenty mice.

THE LONG-TAILED FIELD MOUSE.

THE long-tailed field mouse is smaller than the rat, but larger than the common mouse, and does not live in houses. It is remarkable for the largeness and prominence of its eyes. It differs too both from the rat and the mouse in the colour of its skin, which, while it is tolerably white under the belly, is of a reddish brown upon the back. The species is generally and abundantly diffused.

The largest are above four inches from the tip of the nose to the root of the tail; and the smallest, which appear to be full grown as well as the others, are an inch shorter. Although many are found of different intermediate sizes, the larger and the smaller are all of the same species.

These creatures are fond of dry and elevated grounds. In woods, and in the fields adjoining to them, they are to be found in great numbers. They conceal themselves in holes, which they either find already made, or which they make for themselves, under bushes, or the trunks of hollow trees. In these they amass so prodigious a quantity of acorns, nuts, &c. that in one hole there has been found a bushel at a time.

These holes are generally more than a foot under ground, and often divided into two cells, of which the

one serves for a habitation for itself and its young ones, and the other for a granary. I could never find any other method of preventing their ravages, than that of setting traps at every tenth pace through the whole extent of each piece of new-sown land.

THE WATER RAT.

THE water rat is a little animal, about the size of a common rat, but in its nature and habits it is more like the otter than the rat. Like the otter, it frequents the fresh waters, and is generally found on the borders of rivers, rivulets, and ponds. Like that creature too, it seldom feeds but upon fish, or the spawn of fish, though sometimes it eats frogs, water insects, and even roots and herbs. This animal is not web-footed ; but though every toe of its feet is separated, it swims with ease, keeps itself a long time above water, and thence carries off its prey.

The head of the water rat is shorter, the nose broader, the hair more erect, and the tail much longer than that of the land rat. Like the otter, it flies from large rivers, or rather from those which are too much frequented, and is never found either in houses or in barns. It is probable that these animals bring forth often in a year ; but of these we have no certain information. Their flesh is not absolutely bad ; and in Catholic countries the peasants eat it during Lent, as they do that of the otter. The species is to be found throughout Europe, the extremities of the North excepted.

THE SHORT-TAILED FIELD MOUSE.

THE short-tailed field mouse is still more generally diffused than the long-tailed kind, and is found almost every where; in woods, in meadows, and even in gardens. It is remarkable for the thickness of its head, and the shortness of its tail, which is not above an inch long. It forms holes in the earth, where it hoards up corn, nuts, and acorns; the former of which it prefers to every other kind of food. About the month of July, when the corn begins to ripen, they flock together from every quarter, and frequently do great damage, by cutting the stalk in order to come at the ear. In autumn and winter the greater part of them retire to the woods, where they find beech-mast, nuts, and acorns. Some years they appear in such numbers, that they would destroy every thing were they to subsist long. For want of other food, however, they often eat one another, and are themselves the usual prey of the fox, the wild-cat, the martin, the weasel, and the long-tailed field mouse.

THE GUINEA PIG.

THE Guinea pig, though originally a native of the warm climates of Brasil and Guinea, lives, however,

and breeds, in temperate and even in cold countries, provided it is properly taken care of. Its skin is of little or no value; and the flesh, though people may eat it, is very indifferent food. Their flesh, however, might be rendered better, if they were reared in warrens, and had a proper choice of herbs.

The growth of these animals is not entirely completed till the end of eight or nine months. The female never goes with young above three weeks; and she has been known to bring forth when only two months old. The first litter does not amount to more than four or five. The second amounts to five or six, and the rest to seven or eight, and even to ten or eleven. She does not suckle her young above twelve or fifteen days. In one year a thousand might be obtained from a single couple, did they not frequently destroy each other, and perish from the cold and wet.

The Guinea pig feeds on all sorts of herbs and especially on parsley, which it prefers even to bran, flour, or bread. Of apples and other fruits it is also exceedingly fond. Like the rabbit, it eats quickly, little at a time, but very often. It grunts somewhat like a young pig.

These animals are so delicate, that it is with difficulty they survive the rigours of winter. When they feel cold, they assemble together, press close to one another, and in this situation are frequently found dead.

THE HEDGE-HOG.

THE Hedge-hog has the power of defending itself from an enemy without combating him, and of annoying without attacking him. Possessed of little strength and of no agility by which it might escape its foes, it has received from Nature a prickly armour, with a facility of rolling itself up in a ball, and of presenting from every part of its body a poignant weapon of defence. Even from its fear this animal obtains another engine of security : the smell of its urine, which, when attacked, it generally emits, is sufficient to make its enemy quit the field : thus the generality of dogs are content with barking at the hedge-hog, when it falls in their way, without discovering any inclination to seize it. Of these, however, there are some which, like the fox, have had the address to overcome it, though of the martin, the pole-cat, the ferret, the weasel, or any of the birds of prey, it has no dread.

They are generally found in woods, under the trunks of old trees, as also in the clefts of rocks. I do not believe that they climb up trees, as some naturalists have affirmed, or that they make use of their prickles to carry off the fruit. It is with their mouth they

seize it ; and though they are very numerous in our forests, yet I have never seen one of them upon a tree ; they always remain at the foot, in some hollow space : or under moss : they continue in a state of inactivity during the whole day ; and they only venture abroad by night, but seldom approach human habitations : they sleep during the winter ; and therefore every thing that has been said of their hoarding up provisions for that season must be false. They never eat much, and can subsist very long without any food whatever. Their flesh like that of all other animals which become torpid in winter, is not proper food, nor is their skin of any use.

THE SHREW-MOUSE.

THE Shrew-Mouse seems to fill up the vacuum between the rat and the mole : the shrew-mouse is smaller than the domestic mouse, and resembles the mole in its snout, which is longer than its jaw-bones. Its eyes, though larger than those of the mole, are, in like manner, concealed, and much smaller than those of the domestic mouse : the number of its claws, of which it has five to each foot ; its tail, and its legs, particularly the hind ones, which are shorter than those of the domestic mouse ; its ears, too, and its teeth, resemble those of the mole.

This diminutive creature has a strong smell peculiar to itself, and so offensive to cats, that though they will cheerfully kill the shrew-mouse, they will not eat it. It is evidently this noisome odour, this aversion of the cat to it, that gave rise to the notion that the shrew-

mouse is a venomous animal, and that its bite is so dangerous to every kind of cattle, and particularly to horses : the truth, however, is, that it is neither venomous nor capable of biting ; for it cannot open its mouth wide enough to seize the double thickness of the skin. The distemper among horses, which the vulgar attribute to the tooth of the shrew-mouse, is a swelling which proceeds from an internal cause, and has no connection with any bite, or rather scratch, that this little animal may give.

In winter especially, the shrew-mouse generally fixes its residence in some hay-loft, stable, or barn, where it feeds on grain, insects, and putrid flesh. It is likewise found in woods, and fields, where, living on corn, it sometimes conceals itself under moss or leaves, sometimes under the trunks of trees, sometimes in holes abandoned by moles, and sometimes in holes of a smaller size, which it forms for itself by digging with its claws and snout.

The shrew-mouse is said to produce as many at a birth as the domestic mouse, though less frequently. It has a squeak much more piercing than the latter. In point of nimbleness, however, it is far inferior ; and as it both sees imperfectly, and runs slowly, it is easily taken.

The usual colour of these creatures is brown with a mixture of red. Others of them are ash-coloured ; and they all have a greater or less degree of whiteness upon the belly : they are very common throughout Europe ; but they do not seem to have obtained a footing in America.

THE WATER SHREW-MOUSE.

THE Water Shrew-Mouse, though a native of these regions, was unknown to any of our naturalists till M. Daubenton first discovered it. With respect to the *water shrew-mouse* it is taken at the sources of fountains, in the morning and evening, as the sun rises and sets. In the day-time it remains concealed in the clefts of rocks, or in holes under ground, near the hedges of rivulets. It brings forth in spring, and generally produces nine young ones at a time.

THE MOLE.

THE mole, without being blind, has such small eyes, and these so concealed, that they prove but of little use to it. It enjoys however the senses of hearing and feeling in an eminent degree. Its skin is soft as silk ; and its little paws, which are furnished with five claws, are very different from those of other animals, and almost like the hands of a human being. Proportioned to the size of its body, its strength is great ; it possesses the mild habitudes of repose and of solitude ; the art of securing itself, of forming, in-

stantaneously, an asylum to itself, of extending it, and of obtaining, without the necessity of relinquishing it, an abundant subsistence.

The mole shuts up the entry to its retreat, which it seldom deserts, unless forced to it by heavy rains in summer. It is fond of cultivated grounds, and is never to be found in those which are either muddy, hard, compact, or stony. It requires a soft soil, well supplied with esculent roots, and with insects and worms, of which, indeed, its principal nourishment consists.

As these animals very seldom come above ground, they have but few enemies; and very readily evade the pursuit of animals stronger and swifter than themselves. The chief calamity which befalls them is an inundation; and when this happens, they are seen in numbers attempting to save themselves by swimming, and using every effort to reach the higher grounds. The greatest part, however, perish, as well as their young, which remain in the holes. Were it not for such accidents, from their great fecundity, they would become extremely troublesome. They generally have four or five at a time; and it is easy to distinguish among other mole-hills, that in which the female has brought forth her young. These are made with much greater art than the rest; and are usually larger and more elevated. I am apt to think that they produce oftener than once a year. Of this I am certain, that moles newly produced are found from the month of April to the month of August; a circumstance which, however, may be owing to their having been engendered sooner or later in the year.

The hole in which they produce their young is formed with singular skill, and merits a particular description. The female begins by erecting the earth.

into a spacious apartment supported within by partitions at proper distances, to prevent the roof from falling. As the hillock, in which the apartment is thus formed, is raised above ground, the apartment itself is consequently above the level of the plain, and therefore less subject to accidental slight inundations. The place being thus fitted, she procures grass and dry leaves, as a bed for her young: there they lie secure from wet, and she continues to make their retreat equally free from danger. For round this hill of her own raising, are holes running into the earth, which part from the middle apartment, like rays from a centre, and extend about fifteen feet in every direction: these resemble so many walks or chases, into which the animal makes her subterraneous excursions, and supplies her young with such roots or insects as she can provide. Besides they contribute much to the general safety; for as the mole is very quick of hearing, the instant she perceives her little habitation attacked, she takes to her burrow, and unless the earth be dug away by several men at once, she and her young always make good their retreat.

Some authors have said, but without foundation, that the mole and the badger sleep the whole winter: that this is not true of the badger we have already observed. And as a proof that the mole quits its hole in winter as well as in summer, we have only to view the traces it leaves upon the snow. The mole is so far from sleeping during the winter, that it continues its subterraneous operations then as well as in summer; and the peasants of France even proverbially remark, that "when the moles are at work, a thaw is at hand." They are indeed fond of warm places; and the gardeners often catch them round their hot beds in the months of December, January, and February.

THE BAT.

AN animal which, like the bat, is half quadruped and half bird, and which in fact is neither the one nor the other, is a kind of monster. In the bat, the fore feet are, properly speaking, neither wings nor feet, though the animal uses them both for the purpose of flying and walking. They are in fact, two shapeless extremities, of which the bones are of a monstrous length, and connected by a membrane, neither with feathers nor hair: they are a kind of winged paws, of which we only see one claw about the length of an inch, and of which the other four claws, though very long, cannot act but in conjunction, and have no peculiar movements, no separate functions. They are a kind of hands ten times larger than the feet, and, in all, four times longer than the whole length of the body of the animal. In short they are parts which have rather the appearance of a capricious and accidental, than of a regular and determined production.

To these incongruities, these disproportions of the body and members, may be added the still more striking deformities of the head. In some species, the nose is hardly visible, the eyes are sunk near the tip of the

ear, and are confounded with the cheeks. In others, again, the ears are as long as the body, or else the face is twisted into the form of an horse-shoe, and the nose covered with a kind of crust. Averse, likewise, to the society of all other creatures, they shun the light, inhabit none but dark and gloomy places, to which, after their nocturnal excursions, they are sure to return by break of day, and in which they remain, fixed, as it were, to the walls till the approach of night.

Their motion in the air may be termed an uncertain flutter, which they seem to execute by struggles, and in an awkward manner. They raise themselves from the ground with difficulty, never soar to a great height, and are but imperfectly qualified to accelerate, or even to direct their flight. This, far from being either rapid, or very direct, is performed by hasty vibrations in an oblique and winding direction; and in passing along they do not fail to seize all the gnats, moths, and other nocturnal insects that come in their way. These they swallow entire; and in their excrements we meet with the remains of wings and other dry parts, which they have not been able to digest. Like quadrupeds, the bat brings forth her young alive, and like them it has teeth and nipples.

These animals do not produce more than two at a birth, which they suckle and even carry along with them as they fly. They unite in numbers to defend each other from the cold. They pass the winter without awaking, without stirring, and without eating, from the end of autumn till spring. Notwithstanding, they can more easily support hunger than cold, and can even subsist a number of days without food, they belong to the number of carnivorous animals; for they will devour bacon and meat of all kinds.

THE FAT SQUIRREL.

OF this animal we know three species; namely, the fat squirrel, the garden squirrel and the dormouse. Many authors have confounded these species together, though they are all three very different, and of consequence easily known and distinguished.

The fat squirrel is nearly of the size of the common squirrel, and, like it, its tail is covered with long hair. It is without foundation that these animals have been said to sleep during the winter. They are not in a state of natural sleep at this period. They are in a torpor, which is produced by the coldness of the blood, and by which they lose the use of their members and senses. Their internal heat is indeed so small, that it hardly exceeds that of the temperature of the air. When the heat of the air is at ten degrees above the freezing point of the thermometer, the heat of these animals is also at ten degrees. Now it is well known, that the internal heat of man, and of the most of animals, always exceeds thirty degrees; there is little reason therefore to wonder that these animals, so inferior comparatively to all others in point of heat, should become torpid as soon as their own little quantity of internal heat ceases to be assisted by the external heat of the air. This circumstance, however, naturally happens when the thermometer is not more than ten or eleven degrees above congelation. This is the real cause of the torpor of these animals; a cause of which naturalists have not been apprized, and which, nevertheless, extends to all animals that sleep during the winter.

This torpor continues as long as the cause which produces it, continues to operate, and ceases when the

cold ceases. A few degrees of heat above the tenth or eleventh degree are sufficient to re-animate these creatures ; and if they are kept in a very warm place during the winter, they do not become torpid.

Though in this torpid state, they are without the smallest motion, though their eyes are shut, and they seem to be deprived of all use of the senses, they yet feel pain when it is very acute. This they testify by a movement of contraction, as also by a little hollow cry, which they even repeat several times. I am inclined to believe, that it is not from a too great waste of substance that they perish in long winters, since in autumn they are excessively fat, and on their reviving in spring, they are found to have still remained so. This abundance of fat is an internal nourishment, which is sufficient to support them, and to supply what they lose by perspiration.

The flesh of the fat squirrel is not unlike that of the guinea pig : they were considered as a luxury by the Romans, who reared great numbers of them. Like the common squirrel, this animal lives in forests, climbs to the tops of trees, and leaps from branch to branch. This it does less nimbly indeed than the squirrel, whose legs are longer, whose belly is by no means so big, and which is remarkable for being meagre. Nuts, however, and other wild fruits, form its usual nourishment. It likewise eats little birds which it takes in the nests. It does not, like the squirrel, nestle in the upper parts of trees, but makes a bed of moss for itself in the trunks of those which are hollow. It also shelters itself in the clefts of rocks, and always shews a preference for dry places. It avoids moisture, it drinks little, rarely descends to the ground, and, unlike the squirrel, which is easily tamed, remains always wild. The species is

very generally diffused, but there are few or none of them in England.

THE GARDEN SQUIRREL.

THE fat squirrel frequents the forests, and seems to shun our habitations. The garden squirrel, or greater dormouse on the contrary, inhabits our gardens, and is sometimes in our houses. The species of the latter is also more numerous and more generally diffused.

These animals nestle in the holes of walls, climb up trees, select the best fruits, and gnaw them as they begin to ripen. They climb up pear, apricot, and other trees; and in a scarcity of other fruit, they eat almonds, nuts, and even leguminous roots. These they carry in great quantities to their holes, where they make a bed of herbs, moss, and leaves. The cold stupefies, the heat revives them; and sometimes there are eight or ten found in one place, all in a state of torpor, all huddled together, and rolled up in a ball, in the midst of their hoard of provisions.

Their flesh is not palatable, and has even the disagreeable smell of the house rat.

This animal is to be found in all the temperate climates of Europe, and even in Poland, and in Prussia; but it does not appear that there are any in Sweden, or in any of the more northern countries.

THE DORMOUSE.

OF all the rat species, the dormouse is the least ugly. Its eyes are sparkling, its tail is tufted, and its

hair is rather fair than red. It never lives in houses. It is seldom to be found in gardens, but chiefly frequents the woods, where it finds a shelter in the hollow of some old tree.

The species is by no means numerous, yet they seem to be tolerably common in Italy, and to be known even in the northern climates ; but it does not appear to be an English animal ; for Ray, who had seen it in Italy, observes, that the small dormouse which is found in England is not red upon the back like the Italian, and that it probably belongs to another species.

The dormouse becomes torpid by the cold, and rolls itself up in a ball ; it revives in mild weather, and hoards up nuts and other dry fruits for future sustenance. It forms its nest in trees, like the squirrel, though generally in a lower situation, among the branches of a nut-tree, in a bush, &c. The nest is composed of herbs interwoven, and is about six inches in diameter, has no aperture but at the top, and contains three or four young ones.

THE BROWN RAT.

THE brown rat is both stronger and more mischievous than the black rat. It has a reddish skin, a long tail without hair, the back-bone arched like that of the squirrel, the body much thicker, and whiskers like those of a cat. It is not half a century since this species has been found in the neighbourhood of Paris. They multiply indeed prodigiously, for they generally produce twelve or fifteen, often sixteen, seventeen, eighteen, and even nineteen young ones at a time. The males are larger, stronger, and more mischievous than

the females. When any one pursues, and endeavours to take them, they will turn again, and bite the hand or stick which touches them. Their bite is not only sharp but dangerous, and is immediately followed by a considerable swelling. They bring forth thrice every year, the dams previously preparing a bed for their young; and thus two individuals of this species produce at least three dozen in the space of twelve months.

The brown rat in its nature, and some of its habits, bears a resemblance to the water-rat. Though there is no place but in which they will reside, they seem to delight in living near the water. When they find themselves pursued, and have the same opportunity of sheltering themselves in the water, or in a thorny thicket, they prefer the former, plunge into it without dread, and swim with amazing dexterity. This particularly happens when they cannot get back to their burrows; for they always dig holes for themselves in the earth, or else occupy those of the rabbit. They may also be taken, like that animal, by the ferret, which follows them under ground as it does the rabbit, and even with more ardour.

These animals live principally upon fruit and corn, but are, notwithstanding, exceedingly carnivorous. They devour young rabbits, partridges, and other birds; and when they enter a hen-roost, they destroy, like the pole-cat, more than they eat. They do not become torpid in the winter, like the dormouse, but take advantage of every fine day to come out of their subterranean mansions. Those which live in barns, drive away the mice; and it has even been remarked, that the black rats, as they are called, have been far less common since the brown rats became so numerous.

THE MARMOT.

THE Marmot when taken young, is more capable of being tamed than any other wild animal, and nearly as much so as our domestic ones. It will easily learn to perform feats with a stick, to dance, and to obey the voice of its master. It bears a great antipathy at the dog; and when it becomes familiar in a house, and is certain of being supported by its master, it will, in his presence, attack the largest dogs, and boldly fasten upon them with its teeth. Though this creature is not quite so large as a hare, it is of a more squat make, and has great strength joined to great agility. It has four teeth in the front of the jaw, which are long and strong enough to inflict a terrible wound, and yet, unless provoked to it, it neither attacks dogs, nor does mischief to any other creature. If care be not taken, however, it will gnaw the furniture of an house, and will even make holes through wooden partitions.

As the marmot has very short thighs, and the toes of its paws are formed much like those of the bear, so it often sits erect, and walks with ease, like that animal, upon its hind feet. With its fore paws it carries its food to its mouth, and eats in an upright posture.

like the squirrel. It runs much swifter up a hill than down ; it climbs trees, and runs up the clefts of rocks, or the contiguous walls of houses, with great ease. Indeed, it is ludicrously observed of the Savoyards, who are the general chimney-sweepers of Paris, that they have learned their trade from the marmot.

These animals eat whatever is given them, whether it be flesh, bread, fruits, herbs, roots, pulse, or insects. Of milk and butter, however, they are particularly fond ; and though less inclined to petty thefts than the cat, they are never better pleased than when they obtain access to the dairy.

There seems to be a combination of the bear and the rat in the form of the marmot. Its nose, its lips, and the form of its head, are like those of the hare ; it has the hair and claws of the badger, the teeth of the beaver, the whiskers of the cat, the paws of the bear, with a tufted tail, and short ears. The colour of its hair on the back is reddish brown. On the belly it is reddish, but softer and shorter. Its voice resembles that of a little dog, when it is caressed ; but when it is irritated or frightened, it raises a loud and shrill cry, highly offensive to the ear. The marmot is a very cleanly animal. In autumn particularly it is loaded with fat, though all parts of the body are never equally so. The marmot would be tolerable food, had it not an offensive smell.

This animal, which delights in the regions of ice and snow, and is never found but on the highest mountains, is, nevertheless, most liable to be benumbed by the cold. From the end of September, or the beginning of October, the marmot generally retires to its hole, and does not return till about the beginning of April. The place of its retreat is formed with precaution, and furnish-

ed with art. It is rather wide than long, and very deep, so that it is capable of containing several, without being under a necessity of crowding each other, or injuring the air they breathe. Their feet and claws are formed as they were designed to dig; and, in fact, they burrow into the ground with amazing celerity, scraping up the earth, and throwing back what they have loosened behind them constantly as they proceed. Still more wonderful is the form of their hole; it resembles the letter Y, the two branches having each an opening that conducts into one channel, which terminates in their apartment at the bottom. As the whole is contrived on the declivity of a mountain, there is no part of it on a level but the apartment at the end. One of the branches or openings issues out sloping downward; and this serves as a kind of sink or drain for the whole family, in which they void their excrements, and through which the moisture of the place finds an easy passage. The other branch, on the contrary, slopes upward, and serves them for a door. The apartment at the end is warmly lined with moss and hay. It is even asserted, that this work is carried on by the whole company; that some cut the finest grass, others pile it up, and others take their turns to convey it to the hole. Upon this occasion, it is added, one of them lies upon its back, permits the hay to be heaped upon its belly, keeps its paws upright to make greater room, and in this manner, remaining still upon its back, is dragged by the tail, hay and all, to their common retreat. This practice some assign as a reason for the hair being generally worn away from their backs. However, another, and perhaps a better reason can be given for this appearance; namely, their inhabiting cells under

ground, and being constantly employed in digging up the earth. Whenever they venture abroad, one is placed as a sentinel, sitting on an elevated rock, while the others amuse themselves in the fields below, or are employed in cutting grass, and making it into hay for their future convenience. And no sooner does their sentinel perceive a man, an eagle, a dog, or any other enemy, than he informs the rest by a kind of whistle, and is himself the last that takes refuge in the cell.

They make no provision for the winter. But when they perceive the first approaches of the season in which their vital motions are to continue in some measure suspended, they labour very diligently to close up the apertures of their dwellings, which they effect with such solidity, that it is more easy to open the earth in any other part than where they have closed it. They are at that time very fat, and some of them are found to weigh twenty pounds. In this plight they continue for three months; but by degrees their flesh begins to waste, and they are quite thin by the end of winter. When their retreat is discovered, they are found each rolled into a ball, and covered with hay. In this state they seem entirely lifeless: they may be taken away, and even killed, without betraying any symptom of pain; and those who find them in this manner, carry home the fat ones for food, and the young ones in order to rear and tame them. The marmot produces but once a year, and the litter generally consists of three or four: their growth is quick, and they live only nine or ten years: they are found in the Alps, Appenines, Pyrenees, in the highest mountains of Germany, in Poland and in Canada, with a few variations.

CHAP. XIII.

OF CARNIVOROUS ANIMALS CONTINUED—THE
BEAR—THE BEAVER—THE RACON—THE
COATI—THE AGOUTI.

THE BEAR.

THERE is no animal more generally known than the bear, and yet there is none about which the writers of natural history are less agreed. These uncertainties have arisen from their not distinguishing properly the different species. The land-bear must be distinguished from the sea-bear, which is commonly known by the name of the white, or Greenland bear. The land-bears must also be divided into two classes, the brown, and the black. There are some white land-bears found in Tartary, Russia, &c. which, though they resemble the sea-bear in colour, differ from it, however, in every other particular. It is not the rigour of the climate that makes them white in winter, like the hares and ermines; they are brought forth

white, and always remain so. There are also bears whose skins are a mixture of brown and black, which denotes an intermediate species between the white land-bear and the brown or black bear.

We meet with the brown bear very frequently, and with the black bear very rarely, on the Alps. In the forests of the northern countries of Europe and America, on the contrary, the black bear is very common. The former is both fierce and carnivorous; the latter is only fierce, and constantly refuses to eat flesh.

The bear is not only a savage but a solitary animal; he takes refuge in the most unfrequented parts, and the most dangerous precipices of uninhabited mountains. He makes his den in the most gloomy parts of the forest, in some cavern that has been hollowed by time, or in the hollow of some old enormous tree. Thither he retires alone, and passes a part of the winter without provisions, or without ever stirring abroad. He is not, however, entirely deprived of sensation, like the dormouse, or the marmot, but seems rather to subsist upon the exuberance of his former flesh, and only feels the calls of appetite, when the fat he had acquired in summer is wasted.

When this happens, which, we are told, it generally does after forty or fifty days, the male forsakes his den; but the female remains confined for four months, till she has brought forth her young. That the latter should not only be able to subsist but even to nurse their offspring, without taking any food during that time, is, I think, highly improbable. When with young, however, it is allowed that they are exceedingly fat, as also, that, being covered with a very thick coat, sleeping the greatest part of their time, and tak-

ing no exercise or motion, they must necessarily lose very little by perspiration.

Though the males of the brown species devour their young, when they find an opportunity for it, yet the females seem, on the contrary, to love them with a ferocious distraction. When once they have brought forth, their fury is more violent, as well as more dangerous, than that of the males. Before the young leave the womb, their formation is perfect; and if either the fœtus of the bear, or the bear when newly yeaned, appears at the first glance, unformed, it is merely because there is a want of proportion in the body and members even of the grown bear, and which is well known to be the case in all animals, because the fœtus, or the new produced is always more disproportioned than the grown one.

The voice of the bear is a kind of growl, or harsh murmur, which, when enraged, is heightened by a clashing of the teeth. Highly susceptible of anger, that anger is always furious, and often capricious. However mild he may appear before his master, and even obedient when tamed, he ought still to be distrusted, still treated with circumspection. It is most dangerous to strike him on the tip of the nose, or to touch him on the parts of generation.

He is capable of some degree of instruction. There are few who have not seen him stand on his hind legs, or dance in a rude and awkward measure, to tunes either sung or played on an instrument. But, even in thus tutoring him, it is necessary, in order to succeed, that he should be taken young, and held in constraint ever after. The bear which has passed his youth, is not to be tamed nor even held in awe, and shews himself, if not intrepid, at least fearless of danger.

The wild bear turns not from his path, nor offers to shun the sight of man. It is said, however, by a certain whistle he may be so far charmed as to stop, and stand upon his hind feet : this is the time to shoot him ; for, when only wounded in an attack, he darts with fury at his foe, and, clasping him with his fore paws, is sure to stifle him, unless immediate assistance be given.

The bear enjoys the senses of seeing, hearing, and feeling, in great perfection ; and yet, compared with the size of his body, his eyes are very small. His ears are also short, his skin is coarse, and his hair very thick. His smell is exquisite ; more so, perhaps, than that of any other animal, the internal surface of his nose being very extensive, and excellently calculated to receive the impression of smells. He strikes with his paw as a man strikes with his fists ; but in whatever he may bear a rude kind of resemblance to the human species, he does not gain by this the least ascendancy over other animals.

THE BEAVER.

IN all countries, as man is civilized and improved, the lower ranks of animals are depressed and degraded. Either reduced to servitude, or treated as rebels, all their societies are dissolved, and all their united talents rendered ineffectual. Their feeble arts quickly disappear; and nothing remains but their solitary instincts, or those foreign habitudes which they receive from human education.

The beaver seems to be now the only remaining monument of that kind of intelligence in brutes, which though infinitely inferior, as to its principle, to that of man, supposes, however, certain common projects, has certain relative ends in view. Projects which having society for their basis, suppose some particular method of understanding one another, and of acting in concert.

It is allowed, that the beaver, far from having an absolute superiority over the other animals, seems, on the contrary, to be inferior to some of them. This fact I have an opportunity to confirm, having, for near a twelve-month past, had a young beaver in my possession, which was sent to me from Canada in the beginning of the year 1758. It is an animal tolerably

mild, tranquil, and familiar, though it seemed rather gloomy and melancholy. If we consider this animal, therefore, in its dispersed and solitary state, we shall find, that, as to internal qualities, it is not superior to other animals. It has not more ingenuity than the dog, more sense than the elephant, or more cunning than the fox. It is rather remarkable for the singularities of its external conformation than for any apparent superiority of its internal qualities. Of quadrupeds, the beaver alone has a flat oval tail, covered with scales, which serves as a rudder to direct its motions in the water. It is the only quadruped that has membranes between the toes on the hind feet and at the same time none on the fore ones, with which it conveys its food to its mouth. It is the only one which, while it resembles a terrestrial animal in its fore parts, seems to approach the nature of an aquatic being in its hind ones.

The beavers begin in the month of June or July, to form a society, which is to continue for the greatest part of the year: they arrive in numbers from every side, and presently form a company of two or three hundred. The place of meeting is commonly the place where they fix their abode, which is always by the side of some lake or river. If it be a lake in which the waters are always upon a level, they do not build a dam; but if it be a running stream, they build a dam, or pier, across the river. This dam, or pier, is often four-score or an hundred feet long, and ten or twelve feet thick at the base. If we compare the greatness of the work with the powers of the architect*, it will appear enormous; but the solidity

* The largest beavers weigh from fifty to sixty pounds, and, in length, are little more than three feet from the tip of the snout to the insertion of the tail.

with which it is built is still more astonishing than its size. The part of the river over which this dam is usually built, is where it is most shallow, and where some great tree is found growing by the side of the stream; this they make choice of for the principal part in their building; and, though it is often thicker than a man's body, they soon cut it down. For this operation they have no other instrument than their four incisive teeth, with which they make it fall always across the stream; they then set about cutting the top branches, to make it lie close and even, and serve as the principal beam for their fabric.

These operations are performed in common. At one time a number of beavers are employed together at the foot of the tree in gnawing it down; and, when this part of their labour is finished, it becomes the business of others to separate the branches, while a third party are engaged along the banks of the river, or lake, in cutting other trees, which, though smaller than the first, are yet as thick as the leg, if not the thigh, of a common sized man. These they carry with them by land to the brink of the river, and then by water to the place allotted for their building; where, sharpening them at one end, and forming them into stakes, they drive them into the ground, at a small distance from each other, and fill up the vacant spaces with pliant branches. While some are thus employed in fastening the stakes, others go in search of clay, which they prepare for their purpose with their tails and their feet, and with which, they render their structure still more compact.

This structure is so ingeniously contrived, that it has not only all the extent, and all the solidity, which are requisite, but also a form the most proper for con-

fining the water, and, when it has passed its bounds, for maintaining its weight, or baffling its attack. At the top of their dike or mole, where it is least thick, they form two or three openings: these they occasionally enlarge or contract, as the river occasionally rises or falls; and when, from inundations or torrents, their works have been damaged, they immediately repair them with the utmost care.

After this display of their labours to accomplish a public work, it would be superfluous to add to it a description of their private constructions, were it not that, in history, an account should be given of every fact, and that, in this first grand work of the beaver, the intention uniformly was, that the little habitation of each family should be rendered more commodious.

This habitation is always furnished with two passages; one for the purpose of a land, and the other for that of a water excursion. In shape it is almost always either oval or round; sometimes it is from four to five feet in diameter, and sometimes it consists of two, and even three stories, while the walls are always two feet thick. When it happens to consist of but one story, the walls are but a few feet high, and there is a kind of vault over them, that serves as a covering for the edifice. It is constructed with such solidity as to be impenetrable to the heaviest rains, to defy the most impetuous winds, and is plastered with such neatness, both without and within, that it might naturally be thought an effort of human skill: these animals, nevertheless, use no instrument for the preparation of their mortar, but their feet, or for the application of it, but their tails: they make the greatest use of such materials as are not easily dissolved by water: their wooden work consists of such trees as

grow on the banks of rivers, as these are most easily cut down, stripped of their bark, and carried ; and all these operations they perform before they relinquish a tree which they have once attacked. They cut it at the distance of a foot or a foot and a half from the ground : they sit as they work ; and besides the advantage of this convenient posture, they have the pleasure of continually gnawing fresh bark and soft wood, both which they prefer to most other kinds of aliment ; averse to dry wood, they always provide an ample store of these for their subsistence during winter.* Near their habitations they establish their magazines ; and to each hut or cabin there is one allotted, of a size proportioned to the number of its inhabitants, to which they have all a common right ; nor do they attempt to plunder their neighbours.

Hamlets, to use the expression, have been seen, composed of twenty and even twenty-five dwellings. Such large settlements, however, are rare. In general they do not contain more than ten or a dozen families each of which has its own separate district, magazine, and habitation ; nor will it allow any strangers to settle within its inclosure. The smallest dwellings contain two, four, and six ; the largest, eighteen, twenty, and thirty beavers : and it seldom or never happens, that the number of males and females is not pretty equal. Their society therefore may be said to consist frequently of one hundred and fifty or two hundred workmen, which, having first exerted their united industry and diligence in rearing a grand public work, afterwards form themselves into different bodies, in order to construct private habitations.

* The space allotted for the provision of eight or ten beavers, occupies from twenty-five to thirty feet square, and from eight to ten feet deep.

However numerous the republic of beavers may be, peace and good order are uniformly maintained in it. A common series of toil has cemented their union. The conveniences which they have procured for each other, and the abundance of provisions which, after having amassed, they continue to consume together, render them happy within themselves. Having moderate appetites, entertaining even an aversion to blood and carnage, they have not the smallest propensity to hostility or rapine, but actually enjoy all the blessings which man is only born to desire. Friends to each other, if threatened by any enemies from abroad, they know how to avoid them; and for this purpose, on the first alarm, they give notice of their mutual danger, by striking the water with their tail, which emits a sound that is heard in their most distant dwellings. On this occasion, each beaver as he thinks most expedient, plunges into the water, or conceals himself within the walls of his own habitation, which is in no danger but from the fire of the heavens, or from the weapons of man.

These asylums are not only secure, but also very neat and commodious: the floor is covered with verdure. Young and tender branches of trees serve them for a carpet, on which they never permit any of their excrements to be left. The window which fronts the water serves them for a balcony, from which they enjoy the fresh air, and bathe themselves the greatest part of the day. In the water they remain in an upright posture, the head and fore parts only being visible. This element is, indeed, so necessary to them, or rather gives them so much pleasure, that they seem unable, as it were, to live without frequent immersions in it. Sometimes they go to a considerable

distance under the ice: and then it is easy to take them, if we attack the dwelling and wait for them, at the same time, at a hole which is purposely formed a little way off in the ice, and to which they are obliged to come for breath.

The habit which this animal has, of continually keeping the tail, and all the hind parts of the body in the water, seems to have changed the nature of its flesh: that of the fore parts, till we come to the reins, is of the same quality, taste, and consistency, as the flesh of land animals; and of the tail, and of the hind legs and thighs, has the smell, the savour, and all the qualities of fish. As for the tail in particular, it is an extremity of a fish fixed to the body of a quadruped. In length it generally measures a foot, in thickness an inch, and in breadth five or six inches. It is entirely covered over with scales, and has a skin perfectly the same as that of a large fish.

The females are said to go four months with young: they bring forth about the close of winter, and their number generally consists of two or three at a time. About this period the males leave them, and go forth into the fields, where they enjoy all the sweets of spring. In this season they pay occasional visits to their habitation, but never reside in it. There, however, the females remain employed in suckling, tending, and rearing up their young, who can follow them in a few weeks: they then, in their turn, go abroad, where they feed on fish, or on the bark of young trees, and spend their whole time in the water, or the woods.

Winter is the principal season for hunting them, as it is then only that their fur is in perfection. After their fabrics are demolished, and a great number happen to be taken, their society is never restored.

The few that have escaped captivity or death, become houseless wanderers ; or, concealed in some hole under ground, and reduced to the condition of other animals, they lead a timid life : they no longer employ themselves but to satisfy their immediate and most urgent wants ; they no longer retain those faculties and qualities which they so eminently possess in a state of society.

We meet with beavers in America from the thirtieth degree of north latitude to the sixtieth, and even beyond it. In the northern parts they are very common ; and the farther south we proceed, their number is still found to decrease. The same observation holds with respect to the Old Continent. We never find them numerous but in the more northern countries ; and in France, Spain, Italy, Greece, and Egypt, they are exceedingly rare : they were no strangers to the ancients ; and by the religion of the Magi it was forbidden to kill them.

Several authors have said, that the beaver, being an aquatic animal, could not live solely on land. This opinion, however, is erroneous ; for the beaver which I have in my possession having been taken when quite young in Canada, and been always reared in the house, not did know the water when he was brought to it, was afraid of it, and refused to go into it. Even when first plunged into a bason there was a necessity for keeping him in it by force. A few minutes after, however, he became so well reconciled to it, that he no longer discovered an aversion to his new situation ; and when, afterwards left to his liberty, he frequently returned to it, and would even roll about in the dirt, and upon the wet pavement. One day he made his escape, and descended by a cellar stair-case

into the quarries under the Royal Garden: there he swam to a considerable distance on the stagnated waters which are at the bottom of those quarries; yet no sooner did he see the light of the torches which were ordered down for the purpose of finding him, than he returned, and allowed himself to be taken without the smallest resistance.

He is familiar without being fawning; and when he sees people at table, he is sure to ask something to eat. This he does by a little plaintive cry, and by a few gestures of his fore paws. When he has obtained a morsel, he carries it away, and conceals himself, in order to eat it at his ease. When he sleeps, which he does very often, he lies upon his belly. No food comes amiss to him, meat excepted; and this he constantly refuses either raw or boiled. He gnaws every thing he comes near; and it was found necessary to line with tin the tun in which he was brought over.

Besides the fur, which is indeed the most valuable article furnished by the beaver, this animal furnishes a substance that has been considerably used in medicine. This substance which is known by the name of *castoreum*, is contained in two bladders*. The savages are said to obtain an oil from the tail of the beaver, which they employ as a topical remedy for different complaints. The flesh of this animal, though fat and delicate, is yet bitter, and disagreeable to the palate.

The senses of the beaver are very acute; and so delicate is its smell, that it will suffer no filth to remain near it. When kept too long in confinement, and

* It is pretended, that the beavers extract the liquid which is contained in these bladders by pressing them with the foot; and that it gives them an appetite when they are averse to food. The truth, however, seems to be, that the animal uses this liquid, in order to grease its tail.

under a necessity of voiding its excrements, it drops them near the threshold of its prison, and, when the door is opened, it is sure to push them out.

THE RACCOON.

THE Raccoon is an animal of about the same size as a small badger. Its body is short and bulky. Its fur is fine, long, thick, blackish at the surface, and grey towards the bottom. Its head is like that of the fox, but its ears are round and shorter. Its eyes are large, of a yellowish green, and over them there is a black and transverse stripe. Its snout is sharp. Its tail is thick, but tapering towards a point, and marked alternately from one end to the other with black and white rings, and is at least as long as the body. Its fore legs are much shorter than the hind ones, and both are armed with five strong, sharp claws.

This animal uses its paws to hold its food while eating; and its pointed claws enable it to climb trees with great dexterity. It runs up the trunk with the same swiftness that it moves over the plain, and frolics about to the extremity of the branches with great

security and ease ; on the ground, indeed it rather bounds than runs, and its motions, though oblique, are yet always quick and expeditious.

The racoon is a native of the southern countries of America and the West Indies, nor has it ever yet been found in any parts of the Old Continent.

THE COATI.

THE animal of which we are now about to treat, many authors have called *coati-mondi*. It is very different from the animal described in the preceding article. It is of a smaller size than the racoon. Its body and neck, its head and nose are of a more lengthened form. Its upper jaw is an inch, or an inch and a half longer than the lower one ; and its snout which is moveable in every direction, turns up at the point. The eyes of the coati are also smaller than the eyes of the racoon. Its hair is longer and coarser, its legs are shorter, and its feet longer ; but, like the racoon, its tail is diversified with rings ; and to all its feet there are five claws.

This animal has a practice of eating its own tail, which when not mutilated, is longer than its body, and which it generally raises aloft, and can move with ease in any direction.

From this circumstance we may infer, that in those parts of which the extremities are consequently very remote from the seat of the senses, that feeling must be weak, and the more so, the greater the distance, and the smaller the part.

As for the coati in other respects, it is an animal of prey, which subsists on flesh and blood, which like the fox, destroys small animals and poultry, hunts for the nests of little birds, and devours their eggs ; and it is probably from this conformity of disposition that some authors have considered the coati, as a species of small fox.

THE AGOUTI.

THIS animal is about the size of a hare, and has been improperly considered as a kind of rabbit, or large rat, by the greater number of nomenclators. It has both the hair of a hog, and the voracious appetite of that animal. It eats every thing indiscriminately ;

and when satiated, it hides the remainder, like the dog or the fox, for a future occasion.

It does not, like the rabbit, dig a hole in the ground but burrows in the holes of trees. Its ordinary food consists of the roots of the country, potatoes, yams, and such fruits as fall from the trees in autumn. It uses its fore paws like the squirrel, to carry its food to its mouth; and as its hind feet are longer than the fore ones, it runs very swiftly upon level ground, or up a hill, but upon a declivity it is in danger of falling. Its sight is excellent; its hearing is equal to that of any other animal; and whenever it is whistled to, it stops to listen. The flesh is dressed like that of a sucking pig, and of such as are well fed, it is tolerable food, though it has always a peculiar taste, and is rather tough.

It is hunted by dogs; and whenever it goes into a sugar ground, where the canes cover the place, it is easily caught. When in the open country, it usually runs with great swiftness before the dogs until it gains its retreat, within which it continues to hide, and nothing but filling the hole with smoke can force it out. For this purpose the huntsman burns faggots or straw at the entrance, and conducts the smoke in such a manner that it fills the whole cavity. While this is doing, the poor little animal seems sensible of its danger, begs for quarter with a most plaintive cry, but seldom quits its hole till the utmost extremity.

The agouti seems to be a native of the south parts of America; nor is it at all known in the Old Continent. It is, however, very common in Brasil, Guiana, St. Domingo, and all the neighbouring islands. To the cold and temperate climates of America this animal is an entire stranger.

CHAP XIV.

OF CARNIVOROUS ANIMALS CONTINUED—THE LION
—THE TIGER—THE PANTHER, OUNCE, AND LEOPARD—THE JAGUAR—THE COUGUAR—THE
LYNX—THE CARACAL—THE HYÆNA—THE
CIVET AND ZIBET—THE GENETT—THE
ONDATRA AND DESMAN.

THE LION.

IT has been remarked, that in all hot climates the terrestrial animals are larger and stronger than in cold or temperate ones. They are also bolder and more ferocious, all their natural qualities seeming to partake of the ardour of the climates in which they live. The lion, produced beneath the burning sun of Africa, or of India, is above all others the fiercest and most terrible. Our wolves and other carnivorous animals, far from being his rivals, are hardly worthy to be his providers. The lions of America (if, indeed, they deserve to be called lions) are, like the climate

in which they are produced, infinitely milder than those of Africa ; and what clearly proves that the degree of fierceness in this animal depends on the degree of heat, is, that, even in the same country, those which inhabit the high mountains, where the air is more temperate, are different in disposition from those that dwell in the plains, where the heat is excessive.

As the lion has no enemy but man, and his species is now probably reduced to the fiftieth part of what it formerly was, it follows, that the human race, instead of having suffered a considerable diminution since the time of the Romans, is, on the contrary, more numerous, and more generally diffused. This superiority in the numbers, and the arts of the human species, while it suffices to conquer the lion, serves also to enervate, and to discourage him ; for he is brave only in proportion to the success of his former encounters. Accustomed to measure his strength with every animal he meets, the habit of conquering renders him intrepid and terrible. Having never experienced the dangerous arts and combinations of man, these animals have no apprehensions from his power : they meet him with courage, and seem to brave the force of his arms : they are not daunted even with the opposition of numbers. A single lion of the desert often attacks an entire caravan ; and, after an obstinate combat, when he finds himself overpowered, instead of flying, he continues to combat, retreating, but still facing his enemy till he dies. On the contrary, the lions which inhabit the peopled countries of Morocco, or India, having experienced the superiority of man, have so far lost their courage, as to be scared away with a shout ; and seldom attack any but the unresisting flocks or herds, which even women and children are sufficient to protect.

The external form of the lion seems to speak the superiority of his internal qualities. His figure is striking, his look confident and bold, his gait proud, and his voice terrible. His stature is not overgrown like that of the elephant, or the rhinoceros; nor is his shape clumsy, like that of the hippopotamus, or the ox. He is in every respect compact and well-proportioned, a perfect model of strength joined with agility.

His force and muscular power he manifests by his prodigious leaps and bounds; by the strong and quick agitation of his tail, which alone is sufficient to throw a man on the ground. By the facility with which he moves the skin of his face, and particularly that of his forehead, which adds greatly to his physiognomy, or rather to the expressive fury of his countenance; and in short, by shaking his mane, which is not only bristled up, but moved and agitated on all sides, when he is enraged.

The largest lions are about eight or nine feet long, from the snout to the root of the tail, which is of itself four feet long; and these large lions are about four or five feet high: those of the small size, about five feet and a half long, and three and a half high. In all her dimensions, the lioness is about a fourth less than the lion.

The lion is furnished with a mane, which becomes longer in proportion as he grows older: the lioness, however, is without this appendage at every age: the American animal, which the natives of Peru call *puma*, and to which the Europeans have given the denomination of *lion*, has no mane: It is also much smaller, weaker, and more cowardly than the real lion: in truth, it is very doubtful whether these animals are of the same species.

Both the ancients and the moderns allow that the lion, when newly produced, is not above six or seven inches long ; and if so, some years at least must elapse before he can increase to eight or nine feet ; they likewise mention, that he is not in a condition to walk till two months after he is brought forth ; but, without giving entire credit to these assertions, we may fairly conclude, that the lion, from the largeness of his size, is at least three or four years, in growing, and that, consequently, he must live seven times three or four years, that is, about twenty-five years.

It is usually supposed that the lion does not possess the sense of smelling in such perfection as most other animals of prey. Too strong a light incommodes him. He seldom goes abroad in the middle of the day. He commits all his ravages in the night. When he sees a fire kindled near a herd or flock he will not venture near it. Though his sight is bad, it is not, however, so faulty as his smell ; and, unlike the dog and the wolf, he rather hunts by the former than by the latter.

The lion, when hungry, boldly attacks all animals that come in his way ; but, as he is very formidable, and as they all seek to avoid him, he is often obliged to skulk that he may take them by surprise. For this purpose he crouches upon his belly, in some thicket, or among the long grass, which is found in many parts of the forest. In this retreat he continues, with patient expectation, until his prey comes within a proper distance ; and he then springs after it with such force, that he often seizes it at the first bound. If he misses the effort, and in two or three re-iterated springs cannot seize his prey, he continues motionless for a time, seems to be very sensible of his disappoint-

ment, and waits for a more favourable opportunity. He devours a great deal at a time, and generally fills himself for two or three days to come. His teeth are so strong that he very easily breaks the bones, and swallows them with the rest of the body. It is reported that he can endure hunger a very long time ; but he cannot support thirst in an equal degree, his temperament being extremely hot. He drinks as often as he meets with water, lapping like a dog. He generally requires about fifteen pounds of raw flesh in a day ; and seldom devours the bodies of animals when they begin to putrify. While young and active the lion subsists on what he can obtain by the chase, and seldom quits his native deserts and forests ; but when he becomes old, heavy, and less qualified for exercise, he approaches the habitations of man, to whom he becomes a dangerous enemy. It is observed, however, that when he sees men and animals together, it is always on the latter, never on the former, that he vents his fury ; unless indeed he should be struck, and then, at no loss to know whence the blow came, he instantly deserts his prey, in order to be revenged for the injury. The flesh of the camel he is said to prefer to that of any other animal. He is likewise exceedingly fond of that of young elephants, which from their inability to resist him, till they have received the assistance of their tusks, he easily dispatches, when unprotected by the dam ; nor are there any animals able to oppose the lion, but the elephant, the rhinoceros, the tiger, and the hippopotamus.

However terrible this animal may be, it is not uncommon, with dogs of a large size, and well supported with a proper number of men on horse-back, to chase him, dislodge him, and force him to retire. But for

this enterprise it is necessary that the dogs, and even the horses should be previously disciplined; since almost all animals tremble and fly at the very smell of the lion. Though his skin is firm and compact, it is not, however, proof against a musket-ball, or even a javelin. Like the wolf, he is frequently taken by stratagem; and for this purpose a deep hole is dug in the earth, over which, when slightly covered with earth and sticks, some living animal is fastened, as a bait. When thus entrapped, all his fury subsides; and if advantage be taken of the first moments of his surprise, he may be easily chained, muzzled, and carried off.

The flesh of the lion is of a strong and disagreeable flavour; yet the Negroes and the Indians do not dislike it, and it frequently forms a part of their food.

THE TIGER.

IN the class of carnivorous animals the lion is the foremost. Next to him is the tiger, which, while he possesses all the bad qualities of the former, seems to be a stranger to his good ones. To pride, to courage,

to strength, the lion adds greatness, and sometimes, perhaps, clemency ; while the tiger, without provocation is fierce, without necessity is cruel : thus it is throughout all the classes of Nature, in which the superiority of rank proceeds from that of strength : the first class is less tyrannical than the inferior classes, which, denied so full an exertion of authority, abuse the powers with which they are entrusted.

The tiger is therefore more to be dreaded than the lion. He is the scourge of every country which he inhabits. Of the appearance of man, and of all his hostile weapons, he is fearless. Wild animals as well as tame ones fall a sacrifice before him. He attacks the young elephant and rhinoceros ; and sometimes, with an audacity superior to his nature, he braves the lion himself.

The form of the body usually corresponds with the nature, and the disposition of the animal. The tiger, with a body too long, with limbs too short, with a head uncovered, and with eyes ghastly and haggard, has no characteristics but those of the basest and most insatiable cruelty. Instead of instinct he has nothing but an uniform rage, a blind fury ; so blind indeed, so undistinguishing, that he frequently devours his own progeny, and, if she offers to defend them, he tears in pieces the dam herself.

Happy is it for the rest of nature, that this animal is but rare, and that the species is chiefly confined to the warmest provinces of the east. The tiger is found in Malabar, in Siam, in Bengal, and in all the countries which are inhabited by the elephant or the rhinoceros.

When he has killed a large animal, such as a horse, or a buffalo, he does not devour it upon the spot, but

in order to feast at his ease, he drags it along with such ease to the forest, that the swiftness of his motion seems scarcely retarded by the enormous weight.

To give a still more complete idea of the strength of this terrible creature, we shall quote a passage from Father Tachard, who was an eye-witness of a combat of one tiger against three elephants at Siam. For this purpose, the king ordered a lofty pallisade to be built of bamboo cane, about an hundred feet square ; and in the midst of this were three elephants to combat the tiger. Their heads and part of their trunks were covered with a kind of armour, like a mask, which defended that part from the assaults of the fierce animal with which they were to engage. As soon, says this author, as we were arrived at the place, the largest tiger we had ever seen was brought from his den. He was not at first let loose, but held with cords, so that one of the elephants approaching, gave him three or four blows, with his trunk, on the back, with such force, that the tiger was for some time stunned, and lay without motion, as if he had been dead. However, as soon as he was let loose, and at full liberty, although the first blows had greatly abated his fury, he made at the elephant with a loud shriek, and aimed at seizing his trunk ; but the elephant, wrinkling it up with great dexterity, received the tiger on his great teeth, and tossed him up into the air. This so discouraged the furious animal, that he no more ventured to approach the elephant, but made several circuits round the pallisade, often attempting to fly at the spectators. Shortly after, a second and then a third elephant were sent against him, which struck him so terribly with their trunks, that he once more appeared dead ; and they would certainly have dispatched him, had not a stop been put to the combat.

The tiger, of which Father Gouie has communicated to the Academy of Sciences an anatomical description, composed by the Jesuit Fathers at China, seems to belong to the true species, as also that which the Portuguese have distinguished by the name of *Royal Tiger*. According to Dellon, there is no country of India in which tigers so much abound as Malabar, where the species are numerous, but the largest is that which the Portuguese call the *Royal Tiger*, which is very rare, and is as large as a horse.

The species of the tiger has always been much rarer, and much less generally diffused, than that of the lion. Like the lioness, nevertheless, the tigress produces four or five at a birth. From her nature she is fierce at all times; but when surrounded with her infant progeny, and in the smallest danger of losing them, her fury becomes extravagant. To oppose the daring invaders of her den, she braves every danger. On such occasions, she pursues the spoiler with the most inveterate enmity; who is frequently obliged to drop one of her cubs; with this she immediately returns to her den, and again pursues him: he then drops another; and by the time she has returned with that, he for the most part escapes with the remainder. Should her young be torn from her entirely, she expresses her agony with hideous cries, and follows the sporter to the very town, or ship, in which he may have taken refuge, and dares him to approach her.

The skins of these animals are much esteemed in the east, particularly in China. The Mandarines cover their seats of justice with them, and convert them into coverings for cushions in winter. The Indians eat the flesh of the tiger, and find it neither disagreeable nor unwholesome.

THE PANTHER.

THE panther, ounce, and leopard ; the first of these species which exists in the Old Continent is the *large panther*, which we shall simply call *panther*, and which the Greeks distinguished by the name of *pardalis*, the ancient Latins, first by the name of *panthera*, afterwards by that of *pradus*, and the modern Latins by the name of *leopardus*. The body of this animal, when it has attained its full growth, is five or six feet long from the tip of the nose to the insertion of the tail, which is above two feet long. Its skin is of a yellow hue, more or less dark on the back and sides, and whitish under the belly. It is marked with black spots in the form of beads. Of these rings, the greatest number have one or more spots in the centre, of the same colour with the extremity of the ring. Some of them are oval, and others circular ; and they are frequently above three inches in diameter.

The second species is the *small panther* of Oppian, which our modern travellers have called *ounce*, or *onza*, corruptedly from the name *lynx*, or *lunx*. To this animal we shall preserve the name of *ounce*, which as it has in fact some affinity to the *lynx*, seems to be

properly applied. It is much smaller than the panther; its body, which is nearly of the size of the lynx, being but about three feet and a half long. Its hair, as also its tail, are longer than those of the panther: the latter frequently measures above three feet; though the body of this animal is at least a third less than that of the panther, whose tail does not measure more than two feet, or two and a half at most. The hair of the ounce is of a whitish grey upon the back and sides, and of a grey still whiter under the belly; whereas the back and sides of the panther are always of a yellow more or less deep. In both, however, the spots are nearly of the same form, and of the same size.

The third species is not mentioned by the ancients, as it belongs to Senegal, to Guinea, and to other southern countries which they had not discovered. This animal we shall call *leopard*: a name which has been improperly applied to the large panther, but which, following the example of most travellers, we shall never use unless to denote the above-mentioned animal of Senegal. It is somewhat larger than the ounce, but considerably smaller than the panther, being only four feet long: the tail measures two feet or two feet and a-half. On the back and sides the hair is of a yellow colour, more or less deep; under the belly it is whitish; the spots are annular, but smaller, and less regularly disposed.

As each of these animals is different from the other, so each forms a distinct species. Our furriers call the skins of the first species *panther-skins*; a name which we shall not change: those of the second species they call *African tiger-skins*, which, being an equivocal name, we have set aside, and adopted that of *ounce*.

In short, they improperly call *tiger-skins*, the skins of the animal which we have here denominated the leopard.

The species of the ounce seems to be more numerous, as well as more generally diffused than that of the panther. In Barbary, in Arabia, and in all the southern parts of Asia, Egypt perhaps excepted, it is very common. It is known even in China, where it is distinguished by the name of *hinen pao*.

The ounce is easily tamed, and is employed for the chase, in the hot climates of Asia, where the dog is not to be found, unless introduced from other parts; and then it not only loses its voice, but its instinct. Besides, the panther, the ounce, and the leopard, are alike remarkable for bearing an antipathy to dogs, which they seize in preference to every other animal.

THE JAGUAR.

THE jaguar resembles the ounce both in disposition and in size, and for the most part in the form of the spots with which his skin is diversified. He is less terrible, less ferocious than the panther and the leo-

pard. The ground of his colour, like that of the latter, is of a bright yellow, and not grey like that of the ounce; his tail is shorter than that of either of those animals; his hair is longer than the panther's, but shorter than that of the ounce; it is frizzled while he is young, but smooth and strait when he is full grown.

The jaguar lives by prey like the tiger; but a lighted brand will put him to flight, will deprive him of all courage and vivacity. He seems to partake of the indolence arising from the nature of the climate; nor does he discover any activity or alertness, unless when pressed by hunger.

Almost all the authors who have written the history of the New World, have mentioned this animal; some under the name of *tiger* or *leopard*, others under the names which it bears at Brazil, Mexico, &c. They also speak of another animal of the same genus, and perhaps indeed of the same species, under the name of *jaguaret*, which we have distinguished from the jaguar in our enumeration. Whether they are two distinct species, however, or only varieties of the same species, I cannot positively affirm, having seen only one of the two kinds.

The jaguar is found in Brazil, in Paraguay, in Tucuman, in Guiana, in the country of the Amazons, in Mexico, and in all parts of South America. The jaguaret appears to have been always more rare, or at least this creature has always inhabited such places as are more distant from the haunts of men; and the few travellers who have mentioned it, have only drawn their accounts from those of Marcgravius and Piso.

THE COUGUAR.

THE couguar is as long but not so thick as the jaguar. He has a small head, a long tail, short hair, which is of a lively red colour, intermixed with a few blackish tints, particularly on the upper part of the back. He is neither marked with long stripes, like the tiger, nor with round and full spots, like the leopard, nor with annular spots, like the panther and the ounce. His chin and his neck are whitish, and all the inferior parts of his body. Though less strong than the jaguar, he is as fierce, and perhaps more cruel. He appears too to be more greedy of prey; nor, when once seized, does he ever offer to relinquish it till he has fully glutted his voracious appetite.

This animal is not uncommon in Guiana. Formerly couguars were known to swim over in numbers to the island of Cayenne, to attack and devour the flocks, and were considered as a scourge to the colony. By degrees, however, the settlers lessened their number, and at length expelled them entirely.

The couguar, by the agility of his body and the length of his legs, seems calculated to run, and to climb trees better than the jaguar. They are both equally remarkable for sloth and cowardice when once they are satiated with prey; and seldom known to attack men, unless when they find them asleep. They delight in the lofty shades of forests, where they hide themselves in the covert of some thick tree, in order to dart forth on such animals as pass by. Though they live only upon prey, and quench their thirst more often with blood than with water, yet it has been said by some, that their flesh is exceedingly palatable. Piso says expressly, that it is as good as

veal ; and Charlevoix and others have compared it to mutton. It is hardly credible, however, from the above circumstances, that it can be well tasted ; and therefore I prefer the testimony of Desmarchais, who says, that the best thing about this animal is his skin, with which they make housings for horses, and that its flesh is of no value, being generally lean and of a disagreeable flavour.

THE LYNX.

THE lynx is an animal more commonly found in cold than in temperate climates ; and is at least very rare in hot ones. It was known to the Greeks and the Latins. Pliny says, that the first which were seen in Rome were brought, in the time of Pompey, from Gaul. At present they are not seen in France, a few perhaps excepted, belonging to the Alpine and Pyrenean mountains. But the Romans, under the name of Gaul, comprehended several northern countries ; and, besides, modern France is far from being so cold as ancient Gaul was formerly.

The most beautiful skins of the lynx are brought from Siberia, as belonging to the *lupus cervarius*, and from Canada, as belonging to the *felis-cervarius*. Because they are like all other animals of the New Continent, smaller than those of the Old World. In Europe, they are compared to a wolf in size, and in Canada to a wild cat.

The lynx of which the ancients have said that the sight was so sharp as to penetrate opaque bodies, and of which the urine was made to possess the marvellous property of hardening into a solid substance a precious stone, called *lapis lynceus*, is an animal which never existed. To the true lynx this imaginary one has no affinity, but in name. We must not, therefore, as the most of naturalists have hitherto done, attribute to the former, which is a real being, the properties of this imaginary one, the existence of which, Pliny himself does not seem disposed to believe, and which he classes with the sphynx, the pegasus, and other prodigies, or monsters, the produce of Æthiopia.

Our lynx possesses not the wonderful quality of seeing through walls; but it has bright eyes, a mild aspect, and, upon the whole, an agreeable and lively appearance. Its urine produces not precious stones, but, like the cat, an animal which it nearly resembles, and of which it retains the manners, and even the cleanliness, it covers it over with earth.

The lynx has short legs, and is generally about the size of the fox. It differs from the panther and the ounce in the following particulars. It has long hair, its marks or spots are of a colour less lively, and are badly disposed. Its ears are surrounded at the extremity by a stripe, or rather tuft, of black hair: its tail which is much shorter, is black at the tip; its eyes

have a whitish cast: and its countenance has something in it more mild. The skin of the male is more beautifully marked than that of the female. It does not walk or run like the wolf in a progressive motion, but leaps and bounds like the cat. It gains its sole subsistence by devouring other animals, which it will pursue to the very tops of trees. Neither can the wild cat, the martin, the ermine, nor the squirrel, escape its pursuit. It also seizes birds, lies in wait for the stag, the roebuck, and the hare, and often with one bound seizes them by the throat. When in possession of its prey, it first sucks the blood of the animal, and then lays open the head in order to devour the brains. It then generally abandons the victim of its fury, goes in quest of fresh prey, and is seldom known to return to the former; a circumstance which has given rise to the vulgar remark, that of all animals the lynx has the shortest memory. The skin of this animal changes its colour according to the season and climate. In winter it is in every respect better than it is in summer: and its flesh, like that of all beasts of prey, is improper food.

THE CARACAL, OR SYAGUSH.

THOUGH the caracal resembles the lynx in size, in the formation of the body, and the aspect of the head; and, though like that animal, it seems to have the peculiar, and almost singular characteristic of a stripe of black hair at the extremity of the ears, I am inclined to treat of them as animals of different species.

The caracal is not spotted like the lynx; it has hair rougher and shorter, its tail is larger, and of an uniform colour; its snout is longer; in appearance it is less mild, and in disposition it is fiercer. The lynx is an inhabitant of the cold, or at most of the temperate regions. The caracal, on the other hand, is only found in the hot countries; and it is as much from their difference in disposition and climate that I have judged them to be of two different species, as from the inspection and comparison of the animals themselves.

The caracal is common in Barbary, in Arabia, and in all those countries which are inhabited by the lion, the panther and the ounce. Like them it depends on prey for its subsistence; but, unlike them, from its

inferior size, and its inferior strength, it has much difficulty in procuring its prey. Hardly, indeed, has it any thing to subsist on but what the more potent carnivorous animals are disposed to leave for it. It keeps at a distance from the panther, because that animal exercises its cruelty even after he is satisfied with food ; but it follows the lion, who, when the immediate cravings of his appetite are gratified, is of a pacific disposition. From the refuse of what this noble animal has devoured, the caracal frequently enjoys a comfortable meal. Sometimes, even while the lion is in search of prey, by climbing trees, it braves his fury ; for he cannot ascend after it like the panther. For all these reasons it is, that the caracal has been called the “ lion’s guide,” the “ lion’s provider ;” and that the lion, whose smell is far from being acute, is said to employ this animal to find out prey for him by its scent, of which, for its trouble, it enjoys the remains, when its master is satisfied.

The caracal is about the size of a fox, but much fiercer and stronger. It has been known to attack, tear in pieces, and destroy in a few minutes, a large dog that exerted himself to the utmost. It is very difficult to tame this animal : yet, if taken when very young, and afterwards reared with care, it may be trained to the chase, to which it is by nature inclined, and in which it is sure to succeed, provided it is not let loose but against such animals as are unable to resist it. In India they make use of this animal to take hares, rabbits, and even large birds, all of which it seizes with singular address.

THE HYÆNA.

So striking, and even so singular are the characteristics of the hyæna, that it is hardly possible to be deceived by them. It is, perhaps, the only quadruped which has but four toes to either the fore or hind feet. Like the badger it has an aperture under the tail, which does not penetrate into the interior parts of the body. Its ears are long, straight, and bare: its head is more square and shorter than that of the wolf: its legs, the hind ones especially, are longer: its eyes are placed like those of the dog: the hair of its body, and its mane, are of a dark grey, with a small intermixture of yellow and black, disposed all along in waves: and though its size is equal to that of the wolf, yet it has a contracted appearance.

This solitary creature resides in the caverns of mountains, in the clefts of rocks, or in dens, which it has formed for itself under the earth. Though taken very young, it is very incapable of being tamed. It lives by depredation, like the wolf; but it is a strong-

er animal, and seemingly more daring. It sometimes attacks men, carries off cattle, follows the flocks, breaks open the sheep-cots by night, and ravages with an insatiable voracity. Its eyes are keen and piercing, and it is said to see best at night. If we may credit all the naturalists who have treated of this animal, its cry resembles the sobs or retchings of a man in a violent fit of vomiting; but, according to Kœmpfer, who was an ear-witness of it, it sounds like the lowing of a calf.

The hyæna defends itself against the lion, is not afraid of the panther, and attacks the ounce, which is incapable of resisting it. When at a loss for other prey, it scrapes up the earth with its feet, and devours the carcasses both of animals and men, which, in the countries that it inhabits, are interred promiscuously in the fields. We find this creature in almost all the hot climates of Africa, and of Asia; and it seems probable that the animal called *farasse*, at Madagascar, which resembles the wolf in figure, but which is larger, stronger, and more cruel, may be the *hyæna*.

Of few animals, have so many absurd stories been told as of this. The ancients represent it as being male and female alternately. It appears, however, that the circumstance which gave rise to this fable, is, the opening in the form of a cleft, which both the male and the female have, independently of the parts destined for the purposes of generation. It has been affirmed too, that this creature could imitate the human voice, that it remembered the names of the shepherds, called to them, charmed them, rendered them motionless; that, at the same time, it gave chase to the shepherdesses, made them forget their flocks, and be distracted with love, &c. All these things might

surely happen without the intervention of a hyæna ; and I conclude this article, in order to avoid the reproach which is due to Pliny, of seeming to take a pleasure in compiling and publishing fables.

THE CIVET.

It has been the opinion of most naturalists, that there is only one species of animals that furnishes the perfume known by the name of *civet*, I, however, have seen two that furnish it, and which, though resembling each other in the essential affinities of conformation, do yet differ from each other in so many other characteristics, that there is sufficient reason to consider them as forming different species.

To the first of these animals I have appropriated its original name of *civet* ; and to the second I have given that of *zibet*.

This latter animal differs from the civet, in having a body longer and smaller, a snout more slender, flatter, and somewhat concave at the upper part. Its hair is much shorter and softer. It has no mane, no black under the eyes, or upon the cheeks. All these

characteristics are peculiar to the civet. Some travellers had already suspected that there were two species of civets ; but no person had distinguished them with sufficient accuracy to describe them.

These animals have been called *musk-cats*, or civet-cats : yet they have nothing in common with the cat : they rather resemble the fox, especially in the head. Their coat is diversified with stripes and spots ; a circumstance which has occasioned them to be mistaken for small panthers, by persons who had only seen them at a distance. In every other respect, however, they differ from the panther. The perfume of the civet is very strong, and that of the zibet is strong to an excess.

This humour is found in the opening which each of these animals has near the parts of generation ; and though the odour is so strong, it is yet agreeable, even when it issues from the body of the animal. The perfume of the civet we must not confound with musk, which is a sanguineous humour obtained from an animal altogether different from either the civet, or the zibet. The animal that furnishes the musk is a kind of roe-buck without antlers, or goat without horns ; nor does it possess any property in common with the civet but that of furnishing a strong perfume.

The civets, though natives of the hottest climates of Africa, and of Asia, are yet capable of living in temperate, and even in cold countries, if they are carefully defended from the injuries of the air, and provided with delicate and succulent food. In Holland, where no small emolument is derived from their perfume, they are frequently reared. The perfume of Amsterdam is esteemed preferable to that which is brought from the Levant, or the Indies, which is generally less genuine. That which is imported from

Guinea would be the best of any, were it not that the Negroes, as well as the Indians and the people of the Levant, adulterate it with mixtures of laudanum, storax, and other odorous drugs.

Those who breed these animals for the sake of their perfume, put them in a long and narrow box, in which they cannot turn. This box the person who is employed to collect the perfume opens behind, for this purpose, twice or thrice a week; and, dragging the animal which is confined in it backward by the tail, he keeps it in this position by a bar before: this done, he takes out the civet with a small spoon. The perfume thus obtained, is put into a vessel, and great care is taken to keep it closely shut.

The quantity which a single animal will afford, depends greatly upon its appetite, and the quality of its nourishment. It furnishes more in proportion as it is more delicately and abundantly fed. Raw flesh hashed small, eggs, rice, small animals, birds, young fowls, and particularly fish, are the favourite food of the civet.

The civet is a wild, fierce animal, and, though sometimes tamed, is yet never very familiar. Its teeth are strong and sharp; but its claws are feeble and blunt. It is light and active, and lives by prey, pursuing birds, and other small animals, which it is able to overcome. They are sometimes seen stealing into yards and out-houses, like the fox, in order to carry off poultry. Their eyes shine in the night: and it is very probable that they see better by night than by day. When they fail of animal food, they are found to subsist upon roots and fruits. They very seldom drink; nor do they ever inhabit humid ground; but in burning sands, and in arid mountains, they cheerfully remain.

THE GENETT.

THE genett is an animal smaller than the civet. It has a long body, short legs, a sharp snout, and a slender head. Its fur, which is exceedingly smooth and soft, is of an ash-colour, glossy, and marked with black stripes, which are separate upon the sides, but which unite upon the back. It has also upon its neck a kind of mane, which forms a black streak from the head to the tail, which last is as long as the body, and is marked with seven or eight rings, from the insertion to the tip, which are alternately black and white.

The genett has under the tail, and in the very same place with the civet, an opening, in which is separated a kind of perfume resembling civet, but less strong, and apter to evaporate. It is an animal somewhat larger than the martin, which it is very like, not only in the form of the body, but also in disposition and habit, and from which it seems chiefly to differ in being more easily tamed.

THE ONDATRA, AND THE DESMAN.

THE ondatra and the desman, are two animals which must not be confounded, though they have both been denominated *musk-rats*, and though they have a few common characteristics.

The ondatra, or musk-rat of Canada, differs from the desman in having its toes all separated from each other, in having eyes very conspicuous, and a very short snout. The desman or musk-rat of Muscovy, on the other hand, has the toes of its hind feet united by a membrane. The tail of both is flat; and not only in this circumstance, but in a number of essential characteristics, they differ from the pilori, or musk-rat of the Antilles.

The ondatra is of the size of a small rabbit, and of the form of a rat. Its head is short, and similar to that of the water-rat; its hair is soft and glossy, with a very thick down underneath, nearly like that of the beaver. Its tail is long, and, though of a different form, covered with little scales, in the same manner as those of other rats. Its ears are very short, but not bare, like those of the domestic rat.

The striking singularities which have been remarked in the ondatra, are, the force and great expansion of the muscles of the skin, the suppleness of the false ribs, which permits so considerable a contraction of the body, that the musk-rat is known to obtain an easy entrance into holes too narrow for the admission of animals much smaller than itself. The manner too in which the female voids her urine is a very striking characteristic; the urethra not terminating, as in other quadrupeds, but at a hairy eminence situated over the os pubis: the testicles also, which, as in other rats, are situated on each side of the anus, become prodigiously large while the ardour for propagation lasts. Add to these that the vessels which contain the musk or perfume of this animal, under the form of a milky humour, and which adjoin to the parts of generation, undergo the same changes; that, during the rutting

season, they enlarge and swell to a very great degree ; that they decay soon after, and are at length totally effaced : the change in the bags which contain the perfume is effected more quickly, as well as more completely, than that of the parts of generation : they are common to both sexes, and contain a very copious milky substance, while the animals are hot.

From the ondatra being a native of the same country with the beaver, and from its figure, its colour, and its hair, they have been often compared with each other.

In disposition and instinct also, these animals bear a considerable resemblance to each other. Like the beavers, the ondatras live in society during the winter: they form little dwellings, about two feet and a half, and sometimes more, in diameter ; and in these there is often found an association of several families : to such habitations they do not resort in order to sleep for five or six months, like the marmots ; their only object is, to obtain from them a shelter from the inclemency of the weather : they are of a round form, and are covered with a kind of ceiling about a foot thick : the materials of which they are composed are rushes and certain herbs interwoven, and consolidated with some clay, which they previously prepare for that purpose with their feet.

These animals breed once a year, and generally produce five or six at a time. So strong are their fore teeth, and so excellently calculated for gnawing, that, when one of them is shut up in a box, it presently makes a hole to escape through, even if the wood were of the hardest kind.

These animals are little inclined to ferocity, and when taken young, are easily tamed. In the very

early period of life they are also, which might not be expected, exceedingly handsome; for then the long, and almost bare tail, which renders their figure very disagreeable afterwards, is very short. They play with all the innocence and sprightliness of young cats; they never bite, and might be easily reared, were it not for their obnoxious smell.

CHAP XV.

OF THE PECCARY, OR MEXICAN HOG—OF THE TERNAT BAT—THE SPECTRE—THE FLYING SQUIRREL—THE GREY SQUIRREL—THE PALM SQUIRREL, AND THOSE OF BARBARY, &c.—THE ANTEATERS—THE SHORT AND LONG TAILED MANIS—THE ARMADILLO—THE SPOTTED CAVY—THE OPPOSSUM—THE MARMOSE—THE CAYOPOLIN.

THE PECCARY, OR MEXICAN HOG.

AMONG the animals of the New World, we meet with few species more numerous, or more remarkable, than that of the peccary, or Mexican hog. At the first glance this animal resembles our wild boar, or rather the hog of Siam, which, as we have already observed, is, like our domestic hog, a variety of the wild boar, or wild hog; and for this reason it has been called the boar or hog of America. The peccary, however, is of a distinct species, and refuses to engender either with the wild boar or the hog. It differs, however, from the hog, in a number of characteristics,

both external and internal. It is less corpulent, and its legs are shorter. In the stomach and the intestines there is a difference of conformation. It has no tail, and its bristles are much stronger than those of the wild boar; and, lastly, it has, upon that part of the back which borders upon the buttocks, an opening from which there is discharged an ichorinous humour of a very disagreeable smell. The peccary is the only animal which has an opening in this region of the body. In the civet, the badger, and the genet, the reservoir for the perfume is situated beneath the parts of generation; and in the musk-animals we find it under the belly.

The peccary may be rendered a domestic animal, like the hog, and has pretty much the same habits and natural inclinations. It feeds upon the same aliments; and its flesh, though more dry and lean than that of the hog, is not unpalatable.

These animals are extremely numerous in all the parts of South America: they generally herd two or three hundreds together, and unite, like hogs, in the defence of each other: they are particularly fierce when any attempt is made to rob them of their young: they surround the plunderer, attack him without fear, and frequently his life falls a victim to his rashness.

In its native country, the peccary is more fond of the mountainous parts, than of the low and level grounds. It seems to delight neither in the marshes, nor the mud, like our hogs. It keeps among the woods, where it subsists upon wild fruits, roots, and vegetables. It is also an enemy to the lizard, the toad, and all the serpent kinds with which the uncultivated forests of the New Continent abound. As soon as it perceives a serpent, or a viper, it at once

seizes it with its fore hoofs and teeth, fleas it in an instant, and devours its flesh.

The peccary, like the hog, is very prolific: the young ones follow the dam, and do not separate from her till they have attained maturity. If taken at first they are easily tamed, and soon lose all their natural ferocity: they, however, never display any remarkable signs of docility. They only continue to do no mischief; and they may be permitted to run tame, without any dangerous consequences: they seldom stray far from home; they return of themselves to the sty, and do not quarrel among each other, except when they happen to be fed in common. When enraged, they draw their breath with great force, and their bristles point upward, and do not resemble the bristles of the wild boar so much as the sharp armour of the hedge-hog.

THE ROUSETTE, OR TERNAT BAT,*

The ROUGETTE †, and the VAMPIRE, or SPECTRE ‡.

THE rousette, and the rougette, seem to form two distinct species, which, however, are so like each other, that they ought not, in my opinion, to be classed together: the latter differs from the former solely in the size of the the body, and the colours of the hair. The rousette, whose hair is of a reddish brown, is nine inches long from the tip of the nose to the insertion

* Vulgarly called the *flying dog*, and, by the generality of naturalists, the *great bat of Madagascar*.

† Vulgarly called the *red-necked flying dog*.

‡ An American animal, which has hitherto been solely indicated under the vague names of *great American bat*, or *flying dog of New Spain*.

of the tail, and three feet broad, when the membranes, which serve it for wings, are fully extended. The rougette, whose hair is of a reddish ash-colour, is hardly more than five inches and a half long, and two feet broad ; and its neck is half-encircled with a stripe of hair of a lively red, intermixed with orange-colour, of which we perceive no vestige on the neck of the roussette : they both belong nearly to the same hot climates of the Old Continent. We meet with them in Madagascar, in the island of Bourbon, in Ternate, in the Philippine, and other islands of the Indian Archipelago, where, indeed, they seem to be more general than in the neighbouring continents.

In the hotter countries of the New World, we likewise meet with another flying quadruped, of which we know not the American name, but to which I will affix that of spectre, or vampyre, because it sucks the blood of men, and of animals, while they are asleep, without awaking them : this American animal is of a species different from those of the roussette and the rougette, which are both to be found solely in Africa, and in the southern parts of Asia.

The spectre is smaller than the rougette, which is itself smaller than the roussette : the former, when it flies, seems to be of the size of a pigeon ; the second of the size of a raven ; and the third of the size of a large hen. Of both the roussette, and the rougette, the head is tolerably well shaped ; the ears are short, and nearly like that of a dog. Of the spectre, on the contrary, the nose is longer ; the aspect is as hideous as that of the ugliest bats ; the head is unshapely, and surmounted with large ears, very open, and very straight ; its nose is disfigured. Its nostrils resemble a funnel, and have a membrane at the top, which rises

up in the form of a sharp horn, or cock's comb, and adds greatly to the deformity of its face.

There is no doubt, therefore, but that the species of the spectre is different from those of the roussette and the rougette : it is an animal not less mischievous than it is deformed: it is the pest of man, the torment and the destruction of animals. In confirmation of this truth, a more authentic testimony cannot be produced than that of M. de la Condamine. "The bats," says he, "which suck the blood of horses, of mules, and even of men, when they do not guard against it by sleeping under the shelter of a pavilion, are a scourge common to most of the hot countries of America. Of these are some of a monstrous size. At Borja, and several other places, they have entirely destroyed the large cattle which the missionaries had brought thither, and which had begun to multiply."

The roussette and rougette are larger, stronger, and perhaps even more mischievous than the vampyre; but it is by open force, and in the day as well as in the night, that they commit hostilities. Fowls and small animals are the objects of their destructive fury: they attack men too, and bite their faces most cruelly; but no traveller has accused them of surprizing men and animals while asleep, and of taking such opportunities to suck their blood.

All these bats are carnivorous, and most voracious animals. In a dearth of flesh or fish, they feed on vegetables and fruits of every kind. As they are fond of the juice of the palm-tree, so it is easy to take them by placing in the neighbourhood of their retreat a few vessels filled with palm-tree water, or any other fermented liquor: they fasten to, and suspend themselves from trees with their claws: they are usually seen in

troops, and oftener by night than by day : they shun places that are much frequented ; and their favourite residence is in the deserted parts of islands.

I have frequently thought it worth while to examine how it is possible that these animals should suck the blood of a person asleep, without causing, at the same time, a pain so sensible as to awake him. Were they to cut the flesh with their teeth, or with their claws, the pain of the bite would effectually rouse any of the human species, however soundly asleep. It is only with their tongue, therefore, that it is possible for them to make such minute apertures in the skin, as to imbibe the blood through them, and to open the veins without causing an acute pain.

I have not had an opportunity of observing the tongue of the vampyre ; but that of several roussettes, which Mr Daubenton has attentively examined, seems to indicate the possibility of the fact. It is sharp, and full of prickles directed backward ; and it is probable that these prickles, or points, from their exceeding minuteness, may be insinuated into the pores of the skin, enlarge them, and may penetrate them so deep, as to command a flow of the blood by the continued suction of the tongue. But these circumstances are perhaps exaggerated, or erroneously related, by the writers who have transmitted them to us.

THE FLYING SQUIRREL.

THE flying squirrel is of a particular species, and resembles in few particulars either the squirrel or the rat. He is more common in America than in Europe, where he is seldom seen, except in Lithuania and Russia. This little animal dwells upon trees, like the squirrel. He goes from branch to branch; and when he leaps upon another tree, his skin, which hangs loose on both sides of his body, is stretched forward by his fore legs, and backward by the hind legs, and increases the surface of his body without adding to its weight, and consequently retards the acceleration of his fall; so that this animal, with one leap, bounds to a great distance. This motion is not like the flight of a bird, neither like the fluttering of a bat; both which motions are made by striking the air with repeated vibrations. It is one single leap, effected by the first impulse, the motion of which is only prolonged, and longer, as the body of the animal, presenting to the air the greater surface, finds a greater resistance, and falls more slowly.

The flying squirrel is easily tamed ; but he often flies ; and he must be kept in a cage, or tied with a small chain. He feeds upon bread, fruit, and seeds : he is remarkably fond of the buds and shoots of the birch and pine trees : he does not seek after nuts and almonds, like the squirrel. He makes a bed of leaves, in which he buries himself, and upon which he lies in the day time, and leaves it in the night, or when pressed by hunger. As he has little agility, he becomes easily the prey of martins, and other animals, which climb up the trees ; so that the species is not greatly multiplied, although they have commonly three or four young at a time.

THE GREY SQUIRREL.

THE grey squirrel is found in the northern parts of both continents, and is in shape like a common squirrel, but larger : the colour of his hair is not red, but light, or deep grey ; and his ears are not so hairy towards the extremity, as those of our squirrels. Many authors think the species is different in Europe and America ; that the grey squirrels of Europe are of the common kind, and that they change their colour according to the season, in the northern climates. Without denying this assertion, which does not, however, seem sufficiently proved, we consider the grey squirrel of Europe and America as the same animal, and as a distinct species, separated from that of common squirrels, which are found in the northern parts of both Continents, being of the same size, and of the same colour ; that is, of a red, more or less bright, according to the temperature of the country.

We have very little information with regard to the grey squirrel. Fernandez says, that the grey, or blackish squirrel of America, dwells commonly upon trees, particularly pines; that he feeds upon fruits and seeds; that he lays up store for the winter, in some hollow tree, whither, he retires during that season: the grey squirrel also differs from the others in making his nest at the top of trees like birds.

THE PALM SQUIRREL,

AND THOSE OF BARBARY AND SWITZERLAND.

THE palm squirrel is as large as a rat, or a small squirrel. He lives upon the palm trees, from which he takes his name: Some call him the palmist rat, and others the palm-tree squirrel; and as he is neither of the species of a rat nor a squirrel, we shall call him palmist. His head is very near of the same form as that of the short tailed field mouse, and covered with rough hair: his long tail does not lie on the ground like that of the rat; he carries it erect vertically, without, however, laying it on his body, as the squirrel; it is covered with hair longer than that of his body, but much shorter than the hair of the squirrel's tail: his back is variegated with white and brown stripes, which distinguish the palmist from all other animals, except the squirrels of Barbary and Switzerland.

With respect to the squirrel of Barbary, as he is of the same continent, and of the same climate, of the same size, and very near the same form as the palmist, one should be inclined to think, that they are both of the same species, with some variety; yet there

is still reason to believe them to be different animals. We have seen all the varieties in the king's cabinet. The squirrel of Barbary has the head and forehead more crooked, the ears longer, the tail more bushy than the palmist ; he is more like a rat than a squirrel : the squirrel of Barbary has four white stripes, and the palmist has no more than three : the white stripe is on the palmist's back-bone ; on the contrary, that of the squirrel of Barbary on the same part of his body is brown and red : these animals, indeed, have very nearly the same habits, and are of the same nature as the common squirrel : they are both of a pretty figure : their coat with white stripes is more valuable than that of the squirrel : their shape is shorter, their body lighter and their motions quicker : the palmist, and the squirrel of Barbary, dwell on trees like the common squirrel, but the Swiss squirrel lives upon earth, and like the field mouse, forms a retreat that the water cannot penetrate. He is also less docile and less gentle than the two others. He bites without mercy, (except he is lately tamed,) and he is more like a rat, or a field mouse, than a squirrel, by instinct and nature.

THE ANT-EATER,

THE TAMANOIR, AND THE TAMANDUA.

SOUTH America produces three species of animals, with a long snout, a small mouth, and no teeth, with tongues of a round form, and remarkably long; with which they penetrate into the ant's nests, and draw out the ants, which is their principal food. The first of these ant-eaters is that which the Brazilians call tamandua guacu, or great tamandua, to whom the French that are in America have given the name of tamanoir. This animal is about four feet from the extremity of the snout to the origin of its tail; his head is fourteen or fifteen inches long, his snout stretches out to a great length; his tail, two feet and a half long, is covered with rough hair, which is above a foot long. His neck is short, his head narrow, his eyes black and small, his ears round, his tongue thin, more than two feet long, which he folds again into his mouth, after he draws it entirely out. His legs are but one foot high: the fore legs, are a little higher and more slender than those behind: he has round feet: the fore feet are armed with four claws, the two middle ones are the longest; and those behind have five claws. The hair

of his head and body is black and white ; this animal turns his tail up on his back, and covers his whole body with it, when he is inclined to sleep, or wishes to shelter himself from the rain or the heat of the sun. The long hair of his tail and of his body is not round in all its extent : it is flat towards the end, and feels like dry grass. He waves his tail frequently and hastily when he is irritated, but it hangs down when he is composed, and he sweeps the ground with it as he goes. The tamanoir walks slowly : his feet seems less calculated to walk than to climb, and to fasten round bodies ; and he holds a branch or a stick so fast, that it is impossible to snatch either from him.

The second of these animals is that which the Americans called only temandua, and to whom we shall give this name : he is much smaller than the tamanoir : he is not above eighteen inches from the extremities of the snout to the rump : his head is five inches long, his snout crooked, and flat and long below. He has a tail ten inches long, without hair at the end : his ears are erect and about an inch long, his tongue is round, and eight inches long, placed in a sort of gutter or hollow canal within the lower jaw : his legs are not above four inches long : his feet are of the same form, and have the same number of claws as those of the tamanoir. He climbs up, and holds a branch or a stick fast, like the tamanoir, and his march is equally slow. He does not cover himself with his tail, which cannot shelter him, being almost bare ; the hair of the fore-part is shorter than that of the tamanoir ; when he sleeps he hides his head under his neck and his fore legs.

The third of these animals is that which the naturalists of Guiana call ouatiriouaou, unto which we ap-

appropriated the name of fourmiller, or ant-eater, to distinguish him from the tamanoir and tamandua. He is still much smaller than the tamandua, being not above six or seven inches long from the extremities of the snout to the tail: his head is two inches long: the snout is not near so long as that of the tamanoir, or the tamandua: his tail is seven inches long, but is bent and is bare at the end: his tongue is narrow, long, and flat: his neck is almost bare, the head is large in proportion to the body, his eyes placed low, at a little distance from the corners of the mouth, his ears are small, and hidden by the hair: his legs are but three inches high, his fore feet have no more than two claws, of which the exterior is much longer than the interior: his hind-feet have four claws. He feels smooth, his colour is shining, diversified with red and yellow: his feet are not made to walk, but to climb up, and to take hold of branches of trees, on which he hangs himself by the extremity of the tail.

These three animals, so different in the size and proportions of the body, have, nevertheless, many things in common, with regard to confirmation and their natural instinct. All three feed upon ants, and suck honey and other liquid and viscous substances: they gather crumbs of bread and small pieces of meat with great dexterity: they are easily tamed and domesticated: they can subsist a long time without food: they do not swallow all the liquor which they keep in their mouth, one part of it issues out of their nostrils: they commonly sleep in the day-time, and change their station in the night: they are so slow, that a man may overtake them easily whilst running in open ground. The savages eat their flesh, which has a disagreeable taste.

The tamanoir looks at a distance like a great fox, and for that reason some travellers call him the American fox. He is strong enough to defend himself against a large dog, and even a jaguar. When he is attacked he fights standing on his hind-legs, like the bear, and makes use of his fore-claws, which are murdering weapons, for his protection. He then lies on his back to use his hind legs, and in this situation he is almost invincible; and even after he has put his adversary to death, he keeps his hold a long time. He is covered with long bushy hair, and a very thick skin; besides, his flesh is remarkably hard, and he seldom loses his life in these engagements.

The tamanoir, the tamandua, and the fourmiller, are natives of the hottest climates only of America. They are found in Brazil, in Guiana, and in the country of the Amazons, &c. They do not breed in Canada, nor in other frozen regions of the New World, and do not belong consequently to the Ancient Continent.

THE PANGOLIN,

and PHATAGIN, or the SHORT & LONG-TAILED MANIS.

THESE animals are commonly known under the name of scaly lizards; but we think proper to reject this denomination; 1. because it is a compound; 2.

because it is ambiguous, and applied to both species; because these animals are not only of another kind, but even of another class than the lizards, which are oviparous reptiles, while the pangolin and the phatagin are viviparous quadrupeds.

All the lizards are wholly covered, even under the belly, with a sleek speckled skin, like scales, but the pangolin and the phatagin have no scales under their throat, on the breast, or the belly. The phatagin, however, like the other quadrupeds, has hair on all these under parts of the body; but the pangolin has nothing but a smooth skin without hair. The scales with which all the other parts of the body of these animals are covered, do not stick to the skin: they only adhere to it below; and they are moveable, like the prickles of the porcupine. These scales are so large, so hard, and so sharp, that they frighten and discourage all animals of prey. It is an offensive armour which wounds while it resists.

The most cruel and the most voracious animals, such as the tiger and the panther, make but useless efforts to devour these armed animals. They tread upon them, roll them, but when they attempt to seize them, they are grievously wounded. They can neither terrify them by violence, nor crush them with their weight.

When the pangolin and the phatagin contract themselves, they do not, like the hedge-hog, assume a globular and uniform figure: they form an oblong coat of armour; but their thick and long tail remains outward, and encircles their bodies: this exterior part, by which it seems these animals might otherwise be seized, carries its own defence. It is covered with scales equally hard and sharp with those which cover the body, and as it is convex above, and flat below,

In the form of half a pyramid, the sides are covered with square scales folded in a right angle, as thick and as sharp as the others. Hence the tail seems to be still more strongly armed than the body, the under part of which are unprovided with scales.

The pangolin, or short-tailed manis, is larger than the phatagin, or long-tailed kind; his fore-feet are covered with scales, but the phatagin's feet, and part of his fore-legs have none, being only clothed with hair: the pangolin has also larger scales, thicker, more convex, and not so close as those of the phatagin, which are armed with three sharp points: the scales of the pangolin, on the contrary, are without points, and uniformly sharp: the phatagin is hairy upon the belly, and the pangolin has no hair on that part of the body, but between these scales which cover his back, there are some thick and long hair like the bristles of a hog, which are not found on the back of the phatagin.

The pangolin is from six to eight feet long, including his tail, which is very near as long as the body, though it appears shorter when young. The scales are not then so large nor so thick, and are of a pale colour, which is deeper when the animal is adult: they acquire such a hardness, that they resist a musket ball. Like the ant-eaters, the pangolin and the phatagin live chiefly upon ants: they have also a very long tongue, a narrow mouth, and appear to be without teeth: their body and their tail are also very long, and the claws of their feet very near of the same length and the same form, but equal in number: the ant-eaters are found in America: the pangolin and the phatagin in the East Indies, and in Africa, where the negroes call them quogelo, and eat their flesh, which they reckon a wholesome food: they also use their scales for

different purposes. The pangolin, and the phatagin have nothing disagreeable but their figure; they are gentle, harmless, and innocent: they feed upon insects only: they never run fast, and can only escape the pursuit of men by hiding themselves in hollow rocks, or in holes which they dig for themselves. They are two extraordinary species, not numerous, nor very useful; and their odd form seems to rank them as an intermediate class betwixt the quadrupeds and the reptiles.

THE ARMADILLO.

WHEN a quadruped is mentioned, the very name carries the idea of an animal covered with hair; and yet nature, as if willing to deviate from this characteristic uniformity, vary often astonishes us by uncommon productions. The quadruped animals, which we regard as the first class of living nature, and who are, next to man, the most remarkable beings of this world, are not superior in every thing, nor separated by constant attributes: the first of these characters, which constitutes their name, and which consists in having four feet, is common to lizards, frogs, &c. which, how-

ever, differ from the quadrupeds in many other respects, and form a distinct class. The second general property, to produce young alive, is not peculiar to quadrupeds, since it is common with whales and other fishes of that class. And the third attribute, that of being covered with hair, exists not in several species, which cannot be excluded from the class of quadrupeds, since, this characteristic excepted, they agree with them in every other respect.

Under the general name of armadillo, we may reckon several species which seem to us really distinct ; in all of which the animal is protected by a crust that resembles bone. This crust externally covers the head, the neck, the back, the flanks, the buttocks, and the tail to the very extremity. It is covered by a thin skin, sleek and transparent : the throat, the breast, and the belly, which present a white grainy skin, like that of a plucked fowl. Besides, by viewing these parts with attention, you will perceive the appearance of scales which are of the same substance as the crust. This crust however is not of one piece, like that of the turtle ; it consists of several joined to each other by as many membranes, which put this armour in motion. The number of these natural bands does not depend on the age of the animal ; for the young armadillo and the adults, have in the same species the same number. Father d'Abbeville has distinguished six species of the armadillo, but the principal difference between them consists in the number of divisions in the armour of the different species.

The armadilloes in general are innocent, harmless animals ; but if they can get into gardens, they will eat melons, potatoes, pulse, and roots. Though originally natives of the hot climates of America, they

live in temperate regions. I once saw one in Languedoc, which was fed at home, and went every where without doing any damage or mischief: they walk quickly, but they can neither leap, run, nor climb up trees: they have then no other resources but to hide themselves in their holes, or if they are at too great a distance from them, they contrive to dig one before they are overcome; for they are as expert as the mole herself in digging the ground. They are sometimes caught by the tail before they are out of sight, in which case they make such a resistance, that the tail is broken without bringing out the body. In order, therefore to take them without mutilation, the burrow must be opened. When they find themselves in the hand of the pursuers, they roll themselves up into a ball; and are placed near the fire, to force them to stretch out their coat of mail; which, hard as it is, as it is touched with the finger, the animal receives so quick an impression, that he contracts in an instant. When they are in deep burrows, the method of forcing them out is to smoke them, or to let water run down the hole. Some pretend, that they remain under ground above three months without venturing out. It is true, that they remain in their holes in the daytime, and never go out but in the night to seek for their subsistence. The armadillo is hunted with small dogs, that soon overtake him; but he stops before they have reached him, and contracts himself; in which condition he is carried off. If he finds himself on the brink of a precipice, he escapes the dogs and the huntsmen, by rolling himself up, and falling down like a ball without injury or prejudice to his scales.

These animals are fat, and very prolific. The female brings forth, as it is reported, four young ones

every month, which makes their species very numerous. They are good to eat, and are easily taken with snares laid for them on the banks of rivers, and in the marshy grounds, which they prefer to every other place. It is pretended, that they are not afraid of the bite of the rattle-snake, and that they live in peace with these reptiles, which are often found in their holes. The savages make baskets, boxes, and other small vessels of their scales.

THE PACA, OR SPOTTED CAVY.

THE paca, or spotted cavy, is an animal of the New World, who digs a burrow like a rabbit, to which he has been compared, though there is scarcely any likeness between them. He is much larger than the rabbit, and even than the hare; he has a round head, and a short snout: he is fat and bulky, and, by the form of his body, he is more like a pig, in grunting, waddling, and the manner of eating; for he grubs up the earth like the hog, to find his subsistence. These animals inhabit the banks of rivers, and are found in damp and hot places of South America. Their flesh is very good to eat, and excessively fat. Their skin

is eaten like that of a pig, for which reason a perpetual war is carried on against these animals. Hunters find it very difficult to take them alive; and when they are surprised in their burrows which have two openings, they defend themselves with great obstinacy and bite with excessive fury. Their skin, though covered with short and rough hair, is valuable, because it is spotted on the sides: these animals bring forth young in abundance. Men and animals of prey destroy a great quantity of them, and yet the species is still numerous. They are peculiar to South America, and are not to be met with in the Old Continent.

THE OPOSSUM.

THE opossum is an animal of America, which is easily distinguished from all others by two singular characters: the first is, that the female has under the belly a large cavity, where she receives, and suckles her young: the second is, that the male and the fe-

male have no claws on the great toe of the hind feet, which are separated from the others, as the thumb in the hand of a man, whilst the other toes are armed with crooked claws, as in the feet of other quadrupeds.

The opossum is only found in the south parts of the New World ; but it does not constantly dwell in the hottest climates. It is found not only in Brazil, Guiana, and Mexico, but also in Florida, Virginia, and other temperate regions of this continent. It produces often, and a great number of young each time. Most authors say, four or five young ; others, six or seven. Marcgrave affirms, that he has seen six young living in the bag of the female ; they were about two inches long, they were already very nimble, they went in and out of the bag many times in a day ; they are still small when they are just brought forth. Some travellers say, that they are not larger than flies when they go out of the womb into the bag, and stick to the paps. This fact is not so much exaggerated as some may imagine, for we have seen in animals, whose species is like that of the opossum, young ones sticking to the paps no larger than a bean. Hence we may presume, that in these animals the womb is only the place of conception, of the formation, and of the first unfolding of the fœtus, which increases in the bag.

The young opossums stick to the paps of the dam till they have acquired strength enough to move easily. This is a well authenticated fact, nor is it peculiar to this species only. Some authors pretend, that they stick to the paps for several weeks ; others say, that they remain in the bag only the first month after they proceed from the womb. One may easily open this bag, observe, count, and even feel the young without disturbing them. They will not leave the

pap, which they hold with their mouth, but when they are strong enough to walk; then they fall into the bag, and go out, and seek for their subsistence. They go in again to sleep, to suckle, and to hide themselves when they are terrified. When the mother flies, and carries in it the young, her belly does not seem bigger when she breeds than usual, for in the time of the true gestation, one can scarce perceive her to be pregnant.

From the mere inspection of the form of the feet of this animal, it is easily to judge, that it walks awkwardly, and seldom runs. One walking moderately may easily outstrip it. It climbs up trees with great facility, hides itself in the leaves to catch birds, or hangs itself by the tail, the extremity of which is muscular, and flexible as the hands, so that it may squeeze, and even incurvate all the bodies it seizes upon. It sometimes remains a long time quiet in this situation. Its body hangs with the head downward, when it silently waits for its prey. At other times, it balances itself to jump from one tree to another like the monkeys, which it resembles both in having a large and flexible tail, and in the conformation of its feet. Though it be voracious, and even greedy of blood, which it sucks with avidity, it feeds also upon reptiles, insects, sugar-canes, potatoes, roots, and even leaves and bark of trees. It may be fed as a domestic animal. It is neither wild nor ferocious. It is easily tamed, but its nauseous smell is more offensive than that of the fox. Its figure is also forbidding; for independently of its ears, which resemble those of an owl, of its tail, which resembles that of a serpent, and of its mouth, which is cleft to the very eyes, its body appears always very dirty, because its hair is neither smooth nor curled, but

tarnished, as if covered with dirt. The bad smell of this animal resides in the skin, for its flesh is palatable. The savages hunt this animal, and feast on its flesh with avidity.

THE MARMOSE, OR MURINE OPOSSUM.

THE marmose, or murine opossum, resembles in most respects the latter species. They are natives of the same climate, in the same continent, and are very much alike by the form of the body, the conformation of the feet, and the tail, a part of which is covered with scales, the upper part only being hairy. But the marmose is smaller than the common opossum, his snout is still sharper; the female has no bag under the belly, she has only two loose skins near the thighs, between which the young stick to the paps. When the young are brought forth, they are not so large as small beans. The brood of the marmose is very numerous; we have seen ten small marmoses, each sticking to a pap, and the dam had still four paps unoccupied. I am persuaded that these animals bring forth a few days after the conception: the young are then *fœtus* only, which are not come to the fourth part of the growth; the dam always miscarries, and the *fœtus* save their lives in sticking to the paps, without leaving them till they

have acquired the growth and strength which they would naturally get in the womb.

The CAYOPOLLIN, or MEXICAN OPOSSUM.

THE cayopollin, or Mexican opossum, according to Farnandes, is a small animal, little larger than a rat, very much resembling the opossum in the snout, the ears, and the tail, which is thicker and stronger than that of a rat. He makes use of it, as we do of our hands. He has thin transparent ears. His belly, legs, and feet, are white. The young, when they are frightened, embrace the mother, who lifts them up on the trees. This species has been found on the mountains of New Spain.

THE KANGUROO.

THIS extraordinary quadruped inhabits the western parts of New Holland. It bears a resemblance to the jerboa, to which tribe it has been referred by

many writers ; and it has excited an uncommon degree of curiosity, which has at length been amply gratified ; the animal having been in a measure naturalized in this country.

The size of the full-grown kangaroo, or kangaroo, is nearly that of the common sheep. Its upper parts are very slender, in comparison with the lower ; but the gradation is almost imperceptible, and adds to the picturesque elegance of the animal. The head is not unlike that of the female deer, and the whole countenance mild and placid : the mouth is rather small, the eyes large and brilliant ; the ears sharp, upright, and moderately large ; the neck is thin, tapering, and finely proportioned ; the fore legs are remarkably short, having five toes, furnished with sharp and crooked claws. The body enlarges gradually from the breast downward : the hind parts are extremely stout.

The construction of the feet is very singular, the centre claw being of great size and strength ; and the whole of the foot resembles that of some large bird ; the under part of it is black and granulated, and it rests on its whole length.

This elegant animal is of a pale brown colour, the belly and pouch inclining to white.

The kangaroo sometimes uses all its four feet in running ; but its principal progressive motion is by leaps, which frequently exceed twenty feet at a time ; and these are so rapidly repeated, as to leave the swiftest greyhound far behind ; in this act they are assisted by their tails, which are so strong and muscular, as to be capable of giving a blow sufficient to break the bones of a man.

These animals dig burrows in the ground, like the rabbit, with their fore feet ; and with these they car-

ry their food to their mouths, sitting on their hind legs like the ape or the squirrel.

The colonists hunt them with greyhounds ; but if these are not well assisted when they first seize them, they fight so desperately, both with their teeth and claws, that the dogs are often dreadfully lacerated.

The kangaroo feeds chiefly on grass and other vegetable substances, standing like other quadrupeds on its four feet ; in drinking, it laps the water like a dog.

It sometimes props itself on the base of the tail, springs forward, and kicks in such a manner with its hind legs, that it is dangerous to approach it.

In their native state, these animals are gregarious feeding in herds of forty or fifty together, and that usually at night, seeming particularly to enjoy themselves in the mild serenity of moon-light, at which time they station sentinels around to give the alarm, in case of approaching danger. They have nictating-membranes, which, in the excess of light, they extend at pleasure over the ball of the eye.

The flesh of the kangaroo is eaten, but it is coarse, and far from being considered as an article of luxury.

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