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from E. W. Forbes

CUVIER'S

ANIMAL KINGDOM:

ARRANGED

ACCORDING TO ITS ORGANIZATION,

TRANSLATED FROM THE FRENCH, AND ABRIDGED FOR THE USE OF STUDENTS.

By H. M^cMURTRIE, M.D.

WITH NUMEROUS ILLUSTRATIONS ON WOOD.

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EDITOR'S PREFACE.

THE *Règne Animale* of the illustrious CUVIER is acknowledged to furnish at once the most simple and the most philosophic view of Animated Nature; and therefore the best, not only for the professional student of that most interesting portion of the works of creation, but also for all classes of persons generally who seek (and who is there in these days who does not seek?) for general information upon that most inviting of all subjects.

Cuvier entered upon this work, which to him must have been one of heartfelt pleasure, as the summing-up of a long and active life, devoted to this his favourite study, much better qualified and prepared than any one who had previously attempted a classification of the animal kingdom. Naturally a close and scrutinising observer, intimately acquainted with the structure of animals by the most careful dissection and examination of all the forms of their organisation and all the corre-

sponding functions, learned in all that had been done by his predecessors, in free communication with all the more illustrious of his contemporary labourers in the same field, to what nation soever they happened to belong, combining with a most extended and correct knowledge of all the leading genera now inhabiting the earth, a more extensive acquaintance with those which have perished in the lapse of time and by the course of change, than any other man ever possessed, and above all, being without any preconceived theory, and therefore zealous only for the truth, this great naturalist seemed to be, above all others, the man fitted for affording such a general view of the living world as should be at once clear, striking, and faithful to its subject, and inviting, instructive, and useful to mankind generally.

By grounding his arrangement upon the organisation, he was enabled to communicate as much real information in a few instances of general description, as could have been furnished by a volume of details; and thus, while he was enabled to condense the whole into a moderate compass, all the parts became more clear, and the grand relations of the whole, in which the mighty design—the wisdom and power of God in the works of creation —became most strikingly manifest.

The mind of a truly great man like Cuvier, when condensing and concentrating the rays of knowledge, has an effect very much resembling that of a convex lens in concentrating the rays of light. If the substance of the lens be fine and transparent,

and the form and fashioning true, the lens becomes eyes to the dim-sighted, magnifies the small, brings the distant near, and literally covers the system of things with its own brilliancy, so that the remote and the small are as accessible and open to scrutiny as objects of daily familiarity. This Cuvier has done, in an eminent degree, with respect to the animal kingdom; and hence, though his work is really the most profound, it is the clearest and the most easy to be understood—the book, in short, whereby all mankind may the most speedily and the most accurately obtain a knowledge of this kingdom of nature.

The object of this edition is to bring Cuvier's work within the reach of every class of readers, not by a mutilated abridgment (for the systematic part of the work is so condensed in the original that it cannot be abridged without mutilation), but in substance, as it came from the hand of its great author. In order to accomplish this object, to be able to furnish the requisite number of illustrative engravings, and at the same time to make the work procurable at a very moderate price, a few, and a very few of the more minute details have been omitted. But the book is thereby improved rather than injured; for the author throws much of the details of species into notes, as if the introduction of them into the text would cloud and obscure his main object, that of giving a connected and luminous view of animated nature. This view it has been the constant study of the editor to present unbroken, so that those who may make use of this volume may have the feeling that they are studying Cuvier only, and not Cuvier with the alloying interpolations of a less informed and feebler mind.

The translation may be relied upon as faithful; for, independent of the care bestowed upon it by Dr. M'Murtrie, the American translator, this edition has been carefully revised with the original. The style of the work will speak for itself; but the grand recommendation is, that it is a fac simile of the "Règne Animale," in the English language, and at a moderate price.

October, 1834.

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INTRODUCTION.

As correct ideas respecting Natural History are not very generally formed, it appears necessary to begin by defining its peculiar object, and establishing rigorous limits between it and neighbouring sciences.

In our language, and in most others, the word NATURE is variously employed. At one time it is used to express the qualities a being derives from birth, in opposition to those it may owe to art; at another, the entire mass of beings which compose the universe; and at a third, the laws which govern those beings. It is in this latter sense particularly that we usually personify Nature, and, through respect, use its name for that of its Creator.

Physics, or Natural Philosophy, treats of the nature of these three relations, and is either general or particular. General physics examines abstractedly each of the properties of those moveable and extended beings we call bodies. That branch of it, styled Dynamics, considers bodies in mass; and, proceeding from a very small number of experiments, determines mathematically the laws of equilibrium, and those of motion and of its communication. Its different divisions are termed Statics, Hydrostatics, Hydrodynamics, Mechanics, &c. &c., according to the nature of the particular bodies whose motions it examines. Optics considers the particular motions of light, whose phenomena, which hitherto nothing but experiment has been able to determine, are becoming more numerous.

Chemistry, another branch of general physics, exposes the laws by which the elementary particles of bodies act on each other; the combinations or separations which result from the general tendency of these particles to re-unite; and the modification which the various circumstances capable of separating or approximating them produce on that tendency. It is purely a science of experiment, and is not reducible to calculation.

The theory of heat and that of electricity belong either to Dynamics or Chemistry, according to the point of view in which they are considered.

The ruling method in all the branches of general physics consists in insulating bodies, reducing them to their greatest simplicity by bringing each of their properties separately into action, either by reflection or experiment, and by observing or calculating the results ; and finally, by generalising and connecting the laws of these properties, so as to form a code, referring them, if possible, to one single principle, into which they may all be resolved.

The object of *Particular Physics*, or of *Natural History*—for the terms are synonymous—is the special application of the laws recognised by the various branches of general physics to the numerous and varied beings which exist in nature, in order to explain the phenomena which each of them present.

Within this extensive range, Astronomy also would be included; but that science, sufficiently elucidated by Mechanics, and completely subjected to its laws, employs methods differing too widely from those required by Natural History, to admit of their being cultivated together successfully. Natural History, then, is confined to objects which do not allow of exact calculation, or of precise measurement in all their parts. Meteorology also is subtracted from it and united to general physics; so that, properly speaking, it considers only inanimate bodies called minerals, and the different kinds of living beings, in all of which we may observe the effects, more or less various, of the laws of motion and chemical attraction, and of all the other causes analysed by general physics.

Natural History, in strictness, should employ similar methods with the general sciences; and it does so, in fact, whenever the objects it examines are sufficiently simple to allow it. This, however, is but very rarely the case.

An essential difference between the general sciences and Natural History is, that, in the former, phenomena are examined, whose conditions are all regulated by the examiner, in order, by their analysis, to arrive at general laws ; whereas, in the latter, they take place under circumstances beyond the control of him who studies them, and who seeks to discover, amid their complication, the effects of some general principle already known. He is not, like the experimenter, allowed to subtract them successively from each other, and thus reduce the problem to its elements;—he is compelled to take them entire, with all their conditions at once, and can only perform the analysis in thought. Suppose, for example, we attempt to insulate any of the numerous

phenomena necessary to existence in any of the higher orders of animals; a single one being suppressed, every vestige of life is annihilated.

Dynamics have thus nearly become a science of pure calculation; Chemistry is still a science of pure experiment; and Natural History, in a great number of its branches, will long remain one of pure observation.

These three terms sufficiently designate the methods employed in studying the three branches of the natural sciences; but in establishing between them very different degrees of certainty, they indicate, at the same time, the point to which the two latter should incessantly tend, in order to attain nearer and nearer to perfection. Calculation, if we may so express it, thus commands Nature, and determines her phenomena more exactly than observation can make them known; experiment compels her to unveil; while observation pries into her secrets, and, when refractory, endeavours to surprise her.

There is, however, a principle peculiar to Natural History, which it uses with advantage on many occasions; it is that of the conditions of existence, commonly styled *final causes*. As nothing can exist unless it combine within itself certain conditions which render its existence possible, the component parts of each being must be so arranged as to render possible the whole being, not only with regard to itself, but to its surrounding relations. The analysis of these conditions frequently conducts us to general laws, as certain as those that are derived from calculation or experiment; and it is only when all the laws of general physics and those which result from the conditions of existence are exhausted, that we are reduced to the simple laws of observation.

The most effectual method of obtaining an analysis of them is that of comparison. This consists in successively observing the same bodies in the different positions in which nature places them, or in a mutual comparison of different bodies; until we have ascertained invariable relations between their structures and the phenomena they exhibit. These various bodies are kinds of experiments ready prepared by Nature, who adds to or deducts from each of them different parts, just as we might wish to do in our laboratories; showing us, herself, at the same time, their various results.

In this way we finally succeed in establishing certain laws by which these relations are governed, and which are employed like those that are determined by the general sciences.

The incorporation of these laws of observation with the general laws,

either directly or by the principle of the conditions of existence, would complete the system of the natural sciences, in rendering sensible in all its parts the mutual influence of every being. To this end, should those who cultivate these sciences direct all their efforts.

All researches of this nature, however, presuppose means of distinguishing clearly, and enabling others to distinguish, the bodies they are occupied with ; otherwise we should be continually confounding them. Natural History then should be based on what is called a *System of Nature ;* or a great catalogue, in which all created beings have suitable names, may be recognised by distinctive characters, and be arranged in divisions and subdivisions, themselves named and characterised, in which they may be found.

In order that each being may be recognised in this catalogue, it must be accompanied by the character which distinguishes it from every other : habits or properties which are but momentary cannot furnish this character—they must then be drawn from its conformation.

There is scarcely a single being which has a simple character, or can be recognised by one single feature of its conformation ; a union of several of these traits is almost always required to distinguish one being from those which resemble it in some, but not in all its peculiarities, or who have some of them combined with others of which the first is destitute. The more numerous the beings to be distinguished, the greater should be the number of traits ; so that to distinguish an individual being from all others, it would be necessary, without some concise method, to enter into a complete description of its character. It is to avoid this inconvenience, that divisions and subdivisions have been invented. A certain number only of neighbouring beings are compared with each other, and their characters need only express their differences, which, by the supposition itself, are the least part of their conformation. Such a combination of beings is termed a *genus.*

The same inconvenience would be experienced in distinguishing genera from each other, were it not for the repetition of the operation in uniting the adjoining genera, so as to form an *order,* the orders to form a *class,* &c. Intermediate subdivisions may also be established.

This scaffolding of divisions, the superior of which contain the inferior, is called a *method.* It is in some respects a sort of dictionary, in which we proceed from the properties of things to arrive at their names; being the reverse of the common ones, in which we proceed from the name to arrive at the property.

When the method is good, it does much more than teach us names. If the subdivisions have not been established arbitrarily, but are based on

true fundamental distinctions, on the essential resemblances of beings, that method is the surest means of reducing the properties of beings to general rules, of expressing them in the fewest words, and of stamping them on the memory.

To render it such, we employ an assiduous comparison of beings, directed by the principle of *subordination of character*, which is itself derived from that of the conditions of existence. As every being possesses a mutual adaptation of parts necessary to its mode of existence, some traits of conformation entirely preclude characters which, on the contrary, are necessary in others. When, therefore, we perceive such or such traits in a being, we can calculate beforehand those that co-exist in it, or others that may be incompatible with them. The parts, the properties, or the traits of conformation, which have the greatest number of these relations of incompatibility or of co-existence with others, or, in other words, that exercise the most marked influence upon the whole of the being, are called the *important or dominating characters*; the others are the *subordinate characters*, all varying in degree.

This influence of character is sometimes determined rationally, by the consideration of the nature of the organ. When this is impracticable, we have recourse to simple observation; and a sure mark by which we may recognise the important characters, and one which is drawn from their own nature, is the superior constancy they exhibit, so that in a long series of different beings, approximating according to their degrees of similitude, these characters are the last to vary. That such characters should be preferred for distinguishing the great divisions, and that in proportion as we descend to the inferior subdivisions, we can also descend to subordinate and variable characters, is a rule resulting equally from their influence and constancy.

There can be but one perfect method, which is the *natural method*. We thus name an arrangement in which beings of the same genus are placed nearer to each other than to those of the other genera; the genera of the same order nearer than those of the other orders, and so on. This method is the ideal to which Natural History should tend; for it is evident that if we can reach it, we shall have the exact and complete expression of all nature. In fact, each being is determined by its resemblance to others, and difference from them; and all these relations would be fully given by the arrangement in question. In a word, the natural method would be the whole science, and every step towards it tends to advance the science to perfection.

Life being the most important of all the properties of beings, and the highest of all characters, it is not surprising that it has in all ages

been made the most general principle of distinction; and that natural beings have always been separated into two immense divisions, the *living* and the *inanimate*.

OF LIVING BEINGS, AND ORGANISATION IN GENERAL.

If, in order to obtain a correct idea of the essence of life, we consider it in those beings in which its effects are the most simple, we quickly perceive that it consists in the faculty possessed by certain corporeal combinations, of continuing for a time and under a determinate form, by constantly attracting into their composition a part of surrounding substances, and rendering to the elements portions of their own.

Life then is a vortex, more or less rapid, more or less complicated, the direction of which is invariable, and which always carries along with it molecules of similar kinds, into which individual particles are continually entering, and from which they are continually departing; so that the *form* of a living body is more essential to it than its *matter*.

As long as this motion subsists, the body in which it is, is living—*it lives*. When it finally ceases, the body *dies*. After death, the elements which compose it, the body being abandoned to the ordinary chemical affinities, soon separate; from which, more or less quickly, results the dissolution of the once living body. It was then by the vital motion that its dissolution was arrested, and its elements were held in a temporary union.

All living bodies die after a certain period, whose extreme limit is fixed for each species, and death appears to be a necessary consequence of life, which, by its own action, insensibly alters the structure of the body, so as to render its continuance impossible.

In fact, the living body undergoes gradual, but continual changes, during the whole term of its existence. At first, it increases in dimensions, according to certain proportions, and within limits, fixed for each species, and for each one of its parts; it then augments in density in the most of its parts:—it is this second kind of change that appears to be the cause of natural death.

If we examine the various living bodies more closely, we find they possess a common structure, which a little reflection soon convinces us is essentially necessary to a vortex such as the vital motion. It appears that solids are necessary to these bodies for the maintenance of their forms; and fluids for the preservation of motion in them. Their tissue, accordingly, is composed of network and plates, or of

fibres and solid laminæ, within whose interstices are contained the fluids; it is in these fluids that the motion is most continued and extended. Foreign substances penetrate the body and unite with the fluids; and whilst they nourish the solids by the interposition of their particles, they also detach from them those that are superfluous. It is in a liquid or gaseous form that the matters to be exhaled traverse the pores of the living body; but, in return, it is the solids which contain the fluids, and by their contraction communicate to them part of their motion.

This mutual action of the fluids and solids, this transition of molecules, required considerable affinity in their chemical composition; and such is the fact—the solids of organised bodies being mostly composed of elements easily convertible into fluids or gases. The motion of the fluids needing also a constantly repeated action on the part of the solids, and communicating one to them, required in the latter both flexibility and dilatability; and accordingly we find this character nearly general in all organised solids.

This structure, common to all living bodies—this areolar tissue, whose more or less flexible fibres or laminæ intercept fluids more or less abundant, constitutes what is called the *organisation*. As a consequence of what we have said, it follows that life can be enjoyed by organised bodies only.

Organisation, then, results from a great variety of arrangements, which are all conditions of life; and it is easy to conceive, that if its effect be to alter either of these conditions, so as to arrest even one of the partial motions of which it is composed, the general movement of life must cease.

Every organised body, independently of the qualities common to its tissue, has a form peculiar to itself, not merely general and external, but extending to the detail of the structure of each of its parts; and it is upon this form, which determines the particular direction of each of the partial movements that take place in it, that depends the complication of the general movement of its life—it constitutes its species and renders it what it is. Each part co-operates in this general movement by a peculiar action, and experiences from it particular effects; so that in every being life is a whole, resulting from the mutual action and re-action of all its parts.

Life, then, in general, presupposes organisation in general; and the life proper to each individual being, presupposes an organisation peculiar to that being, just as the movement of a clock presupposes the clock itself; accordingly we behold life only in beings that are organised and formed to enjoy it, and all the efforts of philosophy have never been able to discover matter in the act of organisation, neither of itself, nor by

any external cause. In fact, life seems to exercise upon the elements which constitute the living body, an action contrary to that which the usual chemical affinities would produce, were life extinct. It seems, therefore, impossible for these affinities to produce the living principle; and yet we know of no other power in nature capable of reuniting previously separated particles.

The birth of organised beings is, therefore, the greatest mystery of the organic economy and of all nature: we see them developed, but we never see them being formed; nay, more, all those whose origin we can trace, have at first been attached to a body similar in form to their own, but which was developed before them;—in a word, to a *parent*. So long as the offspring has no independent existence, but participates in that of its parent, it is called a *germ*.

The place to which the germ is attached, and the cause which detaches it and gives it an independent life, vary; but this primitive adhesion to a similar being is a rule without exception. The separation of the germ is called *generation*.

Every organised being reproduces others that are similar to itself; otherwise, death being a necessary consequence of life, the species would soon become extinct. Organised beings have even the faculty of reproducing, in degrees varying with the species, particular parts of which they may have been deprived—this is called the *power of reproduction*.

The development of organised beings is more or less rapid, and more or less extended, as circumstances are more or less favourable. Heat, the abundance and species of nutriment, with other causes, exercise great influence, and this influence may extend to the whole body in general, or to certain organs in particular: thence arises the impossibility of a perfect similitude between the offspring and parent. Differences of this kind, between organised beings, form what are termed *varieties*.

There is no proof, that all the differences which now distinguish organised beings are such as may have have been produced by circumstances. All that has been advanced upon this subject is hypothetical. Experience, on the contrary, appears to prove, that, in the actual state of the globe, varieties are confined within rather narrow limits; and go back as far as we may, we still find these limits the same.

We are thus compelled to admit of certain forms, which, from the origin of things, have perpetuated themselves without exceeding these limits; and every being, appertaining to one or other of these forms, constitutes what is termed a *species*. *Varieties* are accidental subdivisions of species.

Species should be defined *the assemblage of individuals descended one*

from the other, or from common parents, or from such as resemble them as strongly as they resemble each other. But, although this definition is strict, it will be seen that its application to particular individuals may be very difficult, where the necessary experiments have not been made.

Thus then it stands—absorption, assimilation, exhalation, development, and generation, are functions common to all living bodies; birth and death the universal limits of their existence; a porous contractile tissue, containing within its laminæ, fluids or gases in constant motion, the general essence of their structure; substances almost all susceptible of conversion into fluids or gases, and combinations capable of an easy and mutual transformation, being the basis of their chemical composition. Fixed forms that are perpetuated by generation distinguish their species, determine the complication of the secondary functions proper to each of them, and assign to them the parts they are to play on the great stage of the universe. These forms are neither produced nor changed by their own agency—life supposes their existence; its flame can only be kindled in an organisation already prepared, and the most profound meditation, and lynx-eyed and delicate observation, can penetrate no farther than the mystery of the pre-existence of the germs.

DIVISIONS OF ORGANISED BEINGS INTO ANIMALS AND VEGETABLES.

Living or organised beings have always been subdivided into *animate beings*, that is, such as are possessed of sense and motion; and into *inanimate beings*, which are deprived of both these faculties, and are reduced to the simple faculty of vegetating. Although the leaves of several plants shrink from the touch, and the roots are steadily directed towards moisture, and the leaves to light and air; and though parts of vegetables appear to oscillate without any apparent external cause, still these various motions have too little similarity to those of animals to enable us to find in them any proofs of perception or will.

The spontaneous motions of animals required essential modifications even in their purely vegetative organs. Their roots not penetrating the earth, it was necessary they should be able to place within themselves a supply of aliment, and to carry its reservoir along with them. Hence is derived the first character of animals, or their alimentary canal, from which their nutritive fluid penetrates all other parts through pores or vessels, which are a kind of internal roots.

The organisation of this cavity and its appurtenances required varying, according to the nature of the aliment and the operation it had to undergo, before it could furnish juices fit for absorption; whilst the air

and earth present to vegetables nought but elaborated juices ready for absorption.

The animal, whose functions are more numerous and varied than those of the plant, consequently required an organisation much more complicated; besides this, its parts not being capable of preserving one fixed relative position, there were no means by which external causes could produce the motion of their fluids, which required an exemption from atmospheric influence; from this originates the second character of animals, *their circulating system*, one less essential than that of digestion, since in the more simple animals it is unnecessary. The animal functions required organic systems, not needed by vegetables—that of the muscles for voluntary motion, and nerves for sensibility; and these two systems, like the rest, acting only through the motions and transformations of the fluids, it was necessary that these should be most numerous in animals, and that the chemical composition of the animal body should be more complex than that of the plant; and so it is, for one substance more (azote) enters into it as an essential element, whilst in plants it is a mere accidental junction with the three other general elements of organisation, oxygen, hydrogen, and carbon. This then is the third character of animals.

From the sun and atmosphere, vegetables receive for their nutrition water, which is composed of oxygen and hydrogen; air, which contains oxygen and azote; and carbonic acid, which is a combination of oxygen and carbon. To extract their own composition from these aliments, it was necessary they should retain the hydrogen and carbon, exhale the superfluous oxygen, and absorb little or no azote. Such, in fact, is vegetable life, whose essential function is the exhalation of oxygen, which is effected through the agency of light.

Animals also derive nourishment, directly or indirectly, from the vegetable itself, in which the hydrogen and carbon form the principal parts. To assimilate them to their own composition, they must get rid of the superabundant hydrogen and carbon in particular, and accumulate more azote, which is performed through the medium of respiration, by which the oxygen of the atmosphere combines with the hydrogen and carbon of their blood, and is exhaled with them in the form of water and carbonic acid. The azote, whatever part of the body it may penetrate, seems always to remain there*.

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* The experiments of Dr. Edwards are opposed to this opinion; Dr. Edwards's inferences seem to render it probable that azote is absorbed, and again discharged from the circulation.

The relations of vegetables and animals to the surrounding atmosphere are therefore in an inverse ratio—the former reject water and carbonic acid, while the latter produce them. The essential function of the animal body is respiration; it is that which in a manner animalises it; and we shall see that the animal functions are the more completely exercised, in proportion to the greatness of the powers of respiration possessed by the animal. This difference of relations constitutes the fourth character of animals.

OF THE FORMS PECULIAR TO THE ORGANIC ELEMENTS OF THE ANIMAL BODY, AND OF THE PRINCIPAL COMBINATIONS OF ITS CHEMICAL ELEMENTS.

An areolar porous tissue and three chemical elements are essential to every living body; there is a fourth element peculiarly requisite to that of an animal; but this tissue is composed of variously formed meshes, and these elements are variously combined.

There are three kinds of organic materials or forms of texture, the *cellular membrane*, the *muscular fibre*, and the *medullary matter*, and to each form belongs a peculiar combination of chemical elements, as well as a particular function.

The *cellular substance* is composed of an infinity of small fibres and laminæ, fortuitously disposed, so as to form little cells that communicate with each other. It is a kind of sponge, which has the same form as the body, all other parts of which traverse or fill it, and contracting indefinitely on the removal of the causes of its tension. It is this power that retains the body in a given form and within certain limits.

When condensed, this substance forms those laminæ called *membranes;* the membranes, rolled into cylinders, form those more or less ramified tubes named *vessels;* the filaments called *fibres* are resolved into it, and bones are nothing but the same thing indurated by the accumulation of earthy particles.

The cellular substance consists of a combination well known as *gelatine*, characterised by its solubility in boiling water, and forming, when cold, a trembling jelly.

We have not yet been able to reduce the medullary or cerebral matter to its organic particles; to the naked eye, it appears like a soft whitish pulp, consisting of excessively small globules; it is not susceptible of any apparent motion, but in it resides the admirable power of transmitting to the mind the impressions of the external senses, and conveying to the

muscles the orders of the will. It constitutes the greater portion of the brain and the spinal marrow, and the nerves which are distributed to all the sentient organs are, essentially, mere fasciculi or bundles of its ramifications. The *fleshy* or *muscular fibre* is a peculiar sort of filament, whose distinctive property, during life, is that of contracting when touched or struck, or when it experiences the action of the will through the medium of the nerves.

The muscles, direct organs of voluntary motion, are mere bundles of fleshy fibres. All vessels and membranes which have any kind of compression to execute are armed with these fibres. They are always intimately connected with the nervous threads, but those which belong to the purely vegetative functions, contract without the knowledge of the individual, so that, although the will is truly a means of causing the fibres to act, it is neither general nor unique.

The fleshy fibre has for its base a particular substance called *fibrine*, which is insoluble in boiling water, and which seems naturally to assume this filamentous disposition.

The *nutritive fluid* or *the blood*, such as we find in the vessels of the circulation, is not only mostly resolvable into the general elements of the animal body, carbon, hydrogen, oxygen, and azote, but it also contains fibrine and gelatine, almost prepared to contract and to assume the forms of membranes or filaments peculiar to them, all that is ever wanted for their manifestation being a little repose. The blood also contains another combination, which is found in many animal fluids and solids, called *albumen*, whose characteristic property is that of coagulating in boiling water. Besides these, the blood contains almost every element which may enter into the composition of the body of each animal, such as the *lime* and *phosphorus* which harden the bones of vertebrated animals, the *iron* from which the blood and various other parts receive their colour, the *fat* or animal oil which is deposited in the cellular substance to supply it, &c. All the fluids and solids of the animal body are composed of chemical elements found in the blood, and it is only by possessing a few elements more or less, that each of them is distinguished; whence it is plain, that their formation entirely depends on the subtraction of the whole or part of one or more elements of the blood, and in some few cases on the addition of some element from elsewhere.

These operations, by which the blood nourishes the fluid or solid matter of all parts of the body, may assume the general name of *secretions*. This name, however, is often appropriated exclusively to the

production of liquids; while that of *nutrition* is more especially applied to the formation and deposition of the matter necessary to the growth and conservation of the solids.

The composition of every solid organ, and of every fluid, is precisely such as fits it for the part it is to play, and it preserves it as long as health remains, because the blood renews it as fast as it becomes changed. The blood itself by this continued contribution is changed every moment, but is restored by digestion, which renews its matter; by respiration, which delivers it from superfluous carbon and hydrogen; and by perspiration and various other excretions, that relieve it from other superabundant principles.

These perpetual changes of chemical composition form a part of the vital vortex, not less essential than the visible movements and those of translation. The object of the latter is, in fact, but to produce the former.

OF THE FORCES WHICH ACT IN THE ANIMAL BODY.

The muscular fibre is not only the organ of voluntary motion, for we have just seen that it is also the most powerful of the agents employed by nature to produce those transmutations so necessary to vegetative life. Thus the fibres of the intestines produce the peristaltic motion, which causes the alimentary matter therein contained to pass through them; the fibres of the heart and arteries are the agents of the circulation, and through it of all the secretions, &c.

Volition contracts the fibre through the medium of the nerve; and the involuntary fibres, such as those we have mentioned, being also animated by them, it is probable that these nerves are the cause of their contraction.

All contraction, and, generally speaking, every change of dimension in nature, is produced by a change of chemical composition, though it consists merely in the flowing or ebbing of an imponderable fluid, such as caloric; thus also are produced the most violent movements known upon earth, explosions, &c.

There is, consequently, good reason to suppose that the nerve acts upon the fibre through the medium of an imponderable fluid, and the more so, as it is proved that this action is not mechanical.

The medullary matter of the whole nervous system is homogeneous, and must be able to exercise its peculiar functions wherever it is found; all its ramifications are abundantly supplied with blood vessels.

All the animal fluids being drawn from the blood by secretion, we can have no doubt that such is the case with the nervous fluid, and that the medullary matter secretes it.

On the other hand, it is certain that the medullary matter is the sole conductor of the nervous fluid; all the other organic elements restrain and arrest it, as glass arrests electricity.

The external causes which are capable of producing sensations or causing contractions of the fibre are all chemical agents, capable of effecting decompositions, such as light, caloric, the salts, odorous vapours, percussion, compression, &c. &c.

It would appear, then, that these causes act on the nervous fluid chemically, and by changing its composition; this appears the more likely, as their action becomes weakened by continuance, as if the nervous fluid needed the resumption of its primitive composition to fit it for a fresh alteration.

The external organs of the senses may be compared to sieves, which allow nothing to pass through to the nerve, except that species of agent which should affect it in that particular place, but which often accumulates it so as to increase its effect. Thus, the tongue has its spongy papillæ which imbibe saline solutions; the ear, a gelatinous pulp which is violently agitated by sonorous vibrations; the eye, transparent lenses which concentrate the rays of light, &c. &c.

It is probable that what are styled irritants, or the agents which occasion the contractions of the fibre, exert this action by producing on the fibre, by the nerve, a similar effect to that produced on it by the will; that is, by altering the nervous fluid, in the way that is requisite to change the dimensions of the fibre which it influences: but with this process the will has nothing to do, and very often the individual is unconscious of it. The muscles, separated from the body, preserve their susceptibility of irritation as long as the portion of the nerve that remains with them preserves the power of acting on them—with this phenomenon the will has evidently no connexion.

The nervous fluid is altered by muscular irritation, as well as by sensibility and voluntary motion, and the same necessity exists for the re-establishment of its primitive composition.

The transmutations necessary to vegetable life are occasioned by irritants; the aliment irritates the intestine, the blood irritates the heart, &c. These movements are all independent of the will, and generally (while in health) take place without the knowledge of the individual; in several parts, the nerves that produce them are even

differently arranged from those that are appropriated to sensation or dependent on the will, and the very object of this difference appears to be the securing of this independence.

The nervous functions, that is, sensibility and muscular irritability, are so much the stronger at every point, in proportion as their exciting cause is abundant; and as this cause or the nervous fluid is produced by secretion, its abundance must be in proportion to the quantity of medullary or secreted matter, and the amount of blood received by the latter.

In animals that have a circulating system, the blood is propelled through the arteries which convey it to its destined parts, by means of their irritability and that of the heart. If these arteries be irritated, they act more strongly, and propel a greater quantity of blood; the nervous fluid becomes more abundant and augments the local sensibility; this, in its turn, augments the irritability of the arteries, so that this mutual action may sometimes be carried to a great extent. It is called *orgasm;* and when it becomes painful and permanent, *inflammation.* The irritation may also originate in the nerve when exposed to the influence of acute sensations.

This mutual influence of the nerves and fibres, either intestinal or arterial, is the real spring of vegetative life in animals.

As each external sense is penetrable only by certain sensible substances, so each internal organ may be accessible only to this or that agent of irritation. Thus, mercury irritates the salivary glands, cantharides irritate the bladder, &c. These agents are called *specifics.*

The nervous system being homogeneous and continuous, local sensation and irritation debilitate the whole; and each function, by excessive action, may weaken the others. Excess of aliment weakens the power of thought, while long-continued meditation impairs that of digestion, &c.

Excessive local irritation will enfeeble the whole body, as if all the powers of life were concentrated in one single point.

A second irritation produced at another part may diminish, or divert, as it is termed, the first: such is the effect of blisters, purgatives, &c.

Brief as our sketch has been, it is sufficient to establish the possibility of accounting for all the phenomena of physical life, from the properties it presents, by the simple admission of a fluid such as we have defined.

SUMMARY IDEA OF THE FUNCTIONS AND ORGANS OF THE BODIES OF ANIMALS, AND OF THEIR VARIOUS DEGREES OF COMPLICATION.

After what we have stated respecting the organic elements of the body, its chemical principles and acting powers, nothing remains but to give a summary idea of the functions of which life is composed, and of their appropriate organs.

The functions of the animal body are divided into two classes:—

The animal functions, or those proper to animals, that is to say, sensibility and voluntary motion.

The vital, vegetable functions, or those common to animals and vegetables, that is, nutrition and generation.

Sensibility resides in the nervous system.

The most general external sense is that of touch; it is seated in the skin, a membrane that envelopes the whole body, which is traversed in every direction by nerves whose extreme filaments expand on the surface into papillæ, and are protected by the epidermis and other insensible teguments, such as hairs, scales, &c. &c. Taste and smell are merely delicate states of the sense of touch, for which the skin of the mouth and nostrils is particularly organised: the first, by means of papillæ more convex and spongy; the second, by its extreme delicacy and the multiplication of its ever humid surface. We have already spoken of the ear and the eye. In fine, sensations more or less painful may originate in every part of the body through accident or disease.

Many animals have neither ears nor nostrils; several are without eyes, and some are reduced to the single sense of touch, which is never absent.

The action received by the external organs is continued by the nerves to the central masses of the nervous system, which, in the higher animals, consists of the brain and the spinal marrow. The more elevated the nature of the animal, the more voluminous is the brain and the more is the sensitive power concentrated there; the lower the animal, the more medullary masses are dispersed, and in the most imperfect genera, the entire nervous substance seems to melt into the general matter of the body.

That part of the body, which contains the brain and principal organs of sense, is called the head.

When the animal has received a sensation, and this has occasioned volition, it is by the nerves, also, that this volition is transmitted to the muscles.

The muscles are bundles of fleshy fibres whose contractions produce all the movements of the animal body. The extension of the limbs, and every elongation, as well as every flexion and abbreviation of parts, are the effects of muscular contraction. The muscles of every animal are arranged, both as respects number and direction, according to the movements it has to make; and when these motions require force, the muscles are inserted into hard parts, articulated one over another, and may be considered as so many levers. These parts are called bones in the vertebrated animals, where they are internal, and are formed of a gelatinous mass, penetrated by particles of phosphate of lime. In the Mollusca, the Crustacea, and Insects, where they are external, and composed of a calcareous or horny substance that exudes between the skin and epidermis, they are called shells, crusts, and scales.

The fleshy fibres are attached to the hard parts by means of other fibres of a gelatinous nature, which seem to be a continuation of the former, constituting what are called tendons.

The configuration of the articulating surfaces of the hard parts, limits their motion, which are also restrained by cords or envelopes, attached to the sides of the articulations, called ligaments.

It is from the various arrangements of this bony and muscular apparatus, and the form and proportion of the members resulting therefrom, that animals are capable of executing the innumerable movements that enter into walking, leaping, flight and swimming.

The muscular fibres, appropriated to digestion and the circulation, are independent of the will; they receive nerves, however, but the chief of them are subdivided and arranged in a manner which seems to have for its object their independence of the will. It is only in paroxysms of the passions and other powerful affections of the soul, which break down these barriers, that its empire is perceptible, and even then it almost always tends to disorder these vegetative functions. It is, also, in a state of sickness only that these functions are accompanied with sensations: digestion is usually performed unconsciously.

The aliment, divided by the jaws and teeth, or sucked up when liquids constitute the food, is swallowed by the muscular movements of the hinder parts of the mouth and throat, and deposited in the first portions of the alimentary canal which is usually expanded into one or more stomachs; there it is penetrated with juices fitted to dissolve it. Passing thence through the rest of the canal, it receives other juices destined to complete its elimination. The parietes of the canal are pierced with pores which extract from this alimentary mass its nutritious portion; the useless residuum is rejected.

The canal in which this first act of nutrition is performed is a continuation of the skin, and is composed of similar layers; even the fibres that encircle it are analogous to those which adhere to the internal surface of the skin, called the fleshy pannicle. Throughout the whole interior of this canal there is a transudation which has some connexion with the cutaneous perspiration, and which becomes more abundant when the latter is suppressed; the absorption of the skin is even very analogous to that of the intestines. It is in the lowest order of animals that the useless residuum is rejected by the mouth, their intestines resembling a sac with but the one opening.

Even among those where the intestinal canal has two orifices, there are many in which the nutritive juices, being absorbed by the parietes of the intestine, are immediately diffused throughout the whole spongy substance of the body; such, it would appear, is the case with all Insects. But from the Arachnides and Worms upwards, the nutritive fluid circulates in a system of closed vessels, whose ultimate ramifications alone dispense its particles to the parts that are nourished by it; the vessels that convey it are called *arteries*, those that bring it back to the centre of the circulation *veins*. The circulating vortex is here simple, and there double and even triple (including that of the vena portæ); the rapidity of its motion is often assisted by the contractions of a certain fleshy apparatus called the *heart*, which is placed at one or the other centres of circulation, and sometimes at both of them.

In the red-blooded vertebrated animals, the nutritive fluid exudes from the intestines, white or transparent, and is then termed *chyle;* it is poured into the veins, where it mingles with the blood, by two peculiar vessels called *lacteals*. Vessels similar to these lacteals, and forming with them an arrangement called the lymphatic system, also convey to the venous blood the residue of the nutrition of the parts, and the products of cutaneous absorption.

Before the blood is fit to nourish the parts, it must experience from the circumambient element the modification of which we have previously spoken. In animals possessing a circulating system, one portion of the vessels are destined to carry the blood into organs, in which they spread it over a great surface to obtain an increase of this elemental influence. When that element is air, the surface is hollow, and is called *lungs;* when it is water, it is salient, and is termed *branchæi*. There is always an arrangement of the organs of motion for the purpose of propelling the element into, or upon, the organ of respiration.

In animals destitute of a circulating system, air is diffused through every part of the body by elastic vessels called *tracheæ*; or water acts

upon them, either by penetrating through vessels, or by simply bathing the surface of the skin. The respired or purified blood is properly qualified for restoring the composition of all the parts, and to effect what is properly called nutrition. This facility, which the blood possesses, of decomposing itself at every point, so as to leave there the precise kind of particle necessary, is indeed wonderful; but it is this wonder which constitutes the whole vegetative life. For the nourishment of the solids we see no other arrangement than a great subdivision of the extreme arterial ramifications, but for the production of fluids the apparatus is more complex and various. Sometimes the extremities of the vessels simply spread themselves over large surfaces, whence the produced fluid exhales; at others it oozes from the bottom of little cavities. Before these arterial extremities change into veins, they most commonly give rise to particular vessels that convey this fluid, which appears to proceed from the exact point of union between the two kinds of vessels; in this case the blood vessels and the latter, form by interlacing, particular bodies called *conglomerate* or *secretory glands*.

In animals that have no circulation, in insects particularly, the parts are all bathed in the nutritive fluid; each of these parts draws from it what it requires; and if the production of a liquid be necessary, proper vessels floating in the fluid take up by their pores the constituent elements of that liquid.

It is thus that the blood incessantly supports the composition of all the parts, and repairs the injuries arising from those changes which are the continual and necessary consequences of their functions. The general ideas we form with respect to this process are tolerably clear, although we have no distinct or detailed notion of what passes at each point; and for want of knowing the chemical composition of each part with sufficient precision, we cannot render an exact account of the transmutations necessary to effect it.

Besides the glands which separate from the blood those fluids that are destined for the internal economy, there are some which detach other fluids from it that are to be totally ejected, either as superfluous, or for some use to the animal, as the ink of the cuttle-fish, and the purple matter of various Mollusca, &c.

There is a process or phenomenon, infinitely more difficult to comprehend than that of the secretions—the production of the germ. We have even seen that it is to be considered as almost incomprehensible; but the existence of the germ being admitted, the subject presents no particular difficulties. As long as it adheres to the parent,

it is nourished as if it were one of its organs; and when it detaches itself, it possesses its own life, which is essentially similar to that of the adult.

The germ, the embryo, the fœtus, and the new-born animal, have never, however, exactly the same form as the adult, and the difference is sometimes so great that their assimilation has been termed a *metamorphosis*. Thus, no one not previously aware of the fact would suppose that the caterpillar is to become a butterfly.

Every living being is more or less metamorphosed in the course of its growth; that is, it loses certain parts, and developes others. The antennæ, wings, and all the parts of the butterfly, were enclosed beneath the skin of the caterpillar; this skin vanishes along with the jaws, feet, and other organs, that do not remain with the butterfly. The feet of the frog are enclosed by the skin of the tadpole; and the tadpole, to become a frog, parts with its tail, mouth, and branchiæ. The child, at birth, loses its placenta and membranes; at a certain period its thymus gland nearly disappears, and it gradually acquires hair, teeth, and beard; the relative size of its organs is altered, and its body augments in a greater ratio than its head, the head more than the internal ear, &c.

The place where these germs are found, and their germs themselves, are collectively styled the *ovary;* the canal through which, when detached, they are carried into the uterus, the *oviduct;* the cavity in which, in many species, they are compelled to remain for a longer or shorter period previous to birth, the *uterus*.

OF THE INTELLECTUAL FUNCTIONS OF ANIMALS.

The impression of external objects upon the individual, the production of a sensation or of an image, is a mystery into which the human understanding cannot penetrate; and materialism is an hypothesis, so conjectural, that philosophy can furnish no direct proof of the actual existence of matter. The naturalist, however, should examine what appears to be the material condition of sensation, trace the ulterior operations of the mind, ascertain to what point they reach in each being, and assure himself whether they are not subject to conditions of perfection, dependent on the organisation of each species, or on the momentary state of each individual body.

To enable a being to perceive, there must be an uninterrupted communication between the external sense and the central masses of the medullary system. It is, then, only the modification experienced by

these masses that the mind perceives: there may also be real sensations, without the external organ being affected, which originate either in the nervous chain of communication, or in the central mass itself; such are dreams and visions, or certain accidental sensations.

By central masses, we mean a part of the nervous system, that is so much the more circumscribed, as the animal is more perfect. In man, it consists exclusively of a limited portion of the brain; but in reptiles it includes the brain and the whole of the medulla, and of each of their parts taken separately, so that the absence of the entire brain does not prevent sensation. In the inferior classes this extension is still greater.

The perception acquired produces the image of the sensation experienced. Let us trace the cause of that sensation, and thus acquire the *idea* of the object that has produced it. By a necessary law of our intelligence, all ideas of material objects are in time and space.

The modifications experienced by the medullary masses leave impressions there which are reproduced, and thus recal to the mind images and ideas; this is *memory*, a corporeal faculty that varies greatly, according to the age and health of the animal.

Similar ideas, or such as have been acquired at the same time, recal each other; this is the *association of ideas*. The order, extent, and quickness of this association constitute the perfection of memory.

Every object presents itself to the memory with all its qualities or with all its accessary ideas.

Intelligence has the power of separating these accessary ideas of objects, and of combining those that are alike in several different objects under a *general idea*; the object of which no where really exists, nor presents itself *per se*—this is *abstraction*.

Every sensation being more or less agreeable or disagreeable, experience and repeated essays soon show what movements are required to procure the one and avoid the other; and with respect to this, the intelligence abstracts itself from the general rules to direct the *will*.

An agreeable sensation being liable to consequences that are not so, and *vice versa*, the subsequent sensations become associated with the idea of the primitive one, and modify the general rules framed by intelligence—this is *prudence*.

From the application of these rules to general ideas, result certain formulæ, which are afterwards easily adapted to particular cases—this is called *reasoning*.

A lively remembrance of primitive and associated sensations, and of

the impressions of pleasure or pain that belong to them, constitutes *imagination.*

One privileged being, MAN, has the faculty of associating his general ideas with particular images more or less arbitrary, easily impressed upon the memory, and which serve to recal the general ideas they represent. These associated images are styled *signs;* their assemblage is a language. When the language is composed of images that relate to the sense of hearing or of *sounds,* it is termed *speech;* and when relative to that of sight, *hieroglyphics. Writing* is a series of images that relate to the sense of sight, by which we represent the elementary sounds, and, by combining them, all the images relative to the sense of hearing of which speech is composed; it is therefore only a mediate representation of ideas.

Although, with respect to the intellectual faculties, the most perfect animals are infinitely beneath man; it is certain that their intelligence performs operations of the same kind. They move in consequence of sensations received, are susceptible of durable affections, and acquire by experience a certain knowledge of things, by which they are governed independently of actual pain or pleasure, and by the simple foresight of consequences. When domesticated, they feel their subordination, know that the being who punishes them may refrain from so doing if he will; and when sensible of having done wrong, or seeing him angry, they assume a suppliant and deprecating air. In the society of Man they become either corrupted or improved, and are susceptible of emulation and jealousy: they have among themselves a natural language, which, it is true, is merely the expression of their momentary sensations, but Man teaches them to understand another, much more complicated, by which he makes known to them his will, and causes them to execute it.

To sum up all, we perceive in the higher animals a certain degree of reason, with all its consequences, good and bad, and which appears to be about the same as that of children ere they have learned to speak. The lower we descend from Man the weaker these faculties become, and at the bottom of the scale we find them reduced to signs (at times equivocal) of sensibility, that is, to some few slight movements to escape from pain. Between these two extremes, the degrees are infinite.

In a great number of animals, however, there exists another kind of intelligence, called *instinct.* This induces them to certain actions necessary to the preservation of the species, but very often altogether foreign to the apparent wants of the individual; often also very complicated, and which, if attributed to intelligence, would suppose a fore-

sight and knowledge in the species that perform them infinitely superior to what can possibly be admitted. These actions, the result of instinct, are not the effect of imitation, for very frequently the individuals who execute them have never seen them performed by others: they are not proportioned to ordinary intelligence, but become more singular, more wise, more disinterested, in proportion as the animals belong to less elevated classes, and in all the rest of their actions are more dull and stupid. They are so entirely the property of the species, that all its individuals perform them in the same way without ever improving them a particle.

The working Bees, for instance, have always constructed very ingenious edifices, agreeably to the rules of the highest geometry, and destined to lodge and nourish a posterity not even their own. The solitary Bee, and the Wasp also, form highly complicated nests, in which to deposit their eggs. From this egg comes a worm, which has never seen its parent, which is ignorant of the structure of the prison in which it is confined, but which, once metamorphosed, constructs another precisely similar.

The only method of obtaining a clear idea of instinct is by admitting the existence of innate and perpetual images or sensations in the sensorium, which cause the animal to act in the same way as ordinary or accidental sensations usually do. It is a kind of perpetual vision or dream that always pursues it, and it may be considered, in all that has relation to its instinct, as a kind of somnambulism.

There is no visible mark of instinct in the conformation of the animal; but, as well as it can be ascertained, the intelligence is always in proportion to the relative size of the brain, and particularly of its hemispheres.

OF METHOD, AS APPLIED TO THE ANIMAL KINGDOM.

From what has been stated with respect to methods in general, we have now to ascertain what are the essential characters in animals, on which their primary divisions are to be founded. It is evident they should be those which are drawn from the animal functions, that is, from the sensations and motions; for both these not only make the being an animal, but in a manner establish the extent of its animal nature

Observation confirms this position, by showing that their degrees of development and complication accord with those of the organs of the vegetative functions.

The heart and the organs of the circulation form a kind of centre for

the vegetative functions, as the brain and the trunk of the nervous system do for the animal ones. Now we see these two systems become imperfect, and disappear together. In the lowest class of animals, where the nerves cease to be visible, the fibres are no longer distinct, and the organs of digestion are simple excavations in the homogeneous mass of the body. In insects the vascular system even disappears before the nervous one; but, in general, the dispersion of the medullary masses accompanies that of the muscular agents: a spinal marrow, on which the knots or ganglions represent so many brains, corresponds to a body divided into numerous rings, supported by pairs of limbs longitudinally distributed, &c.

This correspondence of general forms, which results from the arrangement of the organs of motion, the distribution of the nervous masses, and the energy of the circulating system, should then be the basis of the primary divisions of the animal kingdom. We will afterwards ascertain, in each of these divisions, what characters should succeed immediately to them, and form the basis of the primary subdivisions.

GENERAL DISTRIBUTION OF THE ANIMAL KINGDOM INTO FOUR GREAT DIVISIONS.

If, divesting ourselves of the prejudices founded on the divisions formerly admitted, we consider only the organisation and nature of animals, without regard to their size, utility, the greater or less knowledge we have of them, and other accessary circumstances, we shall find there are four principal forms, four general plans, if it may be so expressed, on which all animals seem to have been modelled, and whose ulterior divisions, whatever be the titles with which naturalists have decorated them, are merely slight modifications, founded on the development or addition of certain parts, which produce no essential change in the plan itself.

In the first of these forms, which is that of Man, and of the animals most nearly resembling him, the brain and principal trunk of the nervous system are enclosed in a bony envelope, formed by the cranium and vertebræ; to the sides of this intermedial column are attached the ribs and bones of the limbs, which form the frame-work of the body; the muscles generally cover the bones, whose motions they occasion, while the viscera are contained within the head and trunk. Animals of this form we shall denominate.—

ANIMALIA VERTEBRATA,

Or vertebrated animals. They have all red blood, a muscular heart, a mouth furnished with two jaws, one situated either above or before the other; distinct organs of sight, hearing, smell and taste, placed in the cavities of the face; never more than four limbs, the sexes always separated, and a very similar distribution of the medullary masses and the principal branches of the nervous system.

By a closer examination of each of the parts of this great series of animals, we always discover some analogy, even in species the most remote from each other; and may trace the gradations of one same plan from Man to the last of the Fishes.

In the second form there is no skeleton; the muscles are merely attached to the skin, which constitutes a soft contractile envelope, in which, in many species, are formed stony plates, called shells, whose position and production are analogous to those of the mucous body. The nervous system is contained within this general envelope along with the viscera, and is composed of several scattered masses connected by nervous filaments; the chief of these masses is placed on the œsophagus, and is called the brain. Of the four senses, the organs of two only are observable, those of taste and sight, the latter of which is even frequently wanting. One single family alone presents organs of hearing. There is always, however, a complete system of circulation, and particular organs for respiration. Those of digestion and secretion are nearly as complex as in the Vertebrata. We will distinguish the animals of this second form by the appellation of

ANIMALIA MOLLUSCA,

Or soft animals. Although, as respects the external configuration of the parts, the general plan of their organisation is not as uniform as that of the Vertebrata, there is always an equal degree of resemblance between them in the structure and the functions.

The third form is that remarked in Worms, Insects, &c. Their nervous system consists of two long cords, running longitudinally through the abdomen, dilated at intervals into knots or ganglions. The first of these knots, placed over the œsophagus, and called the brain, is scarcely any larger than those that are along the abdomen, with which they communicate by filaments that encircle the œsophagus like a necklace. The covering or envelope of the body is divided by trans-

verse folds into a certain number of rings, whose teguments are sometimes soft, and sometimes hard; the muscles, however, being always situated internally. Articulated limbs are frequently attached to the trunk; but very often there are none. We will call these animals

ANIMALIA ARTICULATA,

Or articulated animals, in which is observed the transition from circulation in closed vessels to nutrition by imbibition, and the corresponding transition from respiration in circumscribed organs to that effected by tracheæ or air-vessels distributed throughout the body. In them, the organs of taste and sight are the most distinct; one single family alone presenting that of hearing. Their jaws, when they have any, are always lateral.

The fourth form, which embraces all those animals known by the name of Zoophytes, may also properly be denominated

ANIMALIA RADIATA,

Or radiated animals. We have seen that the organs of sense and motion in all the preceding ones are symmetrically arranged on the two sides of an axis. There is a posterior and anterior dissimilar face. In this last division, they are disposed like rays round a centre; and this is the case even when they consist of but two series, for then the two faces are similar. They approximate to the homogeneity of plants, having no very distinct nervous system or particular organs of sense; in some of them, it is even difficult to discover a vestige of circulation; their respiratory organs are almost universally seated on the surface of the body, and the lowest of the series are nothing but a sort of homogeneous pulp endowed with motion and sensibility.

FIRST GREAT DIVISION OF THE ANIMAL KINGDOM.

ANIMALIA VERTEBRATA.

The bodies and limbs of vertebrated animals being supported by a frame-work or skeleton composed of connected pieces that are moveable upon each other, their motions are certain and vigorous. The solidity of this support enables them to attain considerable size, and it is among them that the largest animals are found.

The great concentration of the nervous system, and the volume of its central portions, give energy and stability to their sentiments, whence result superior intelligence and perfectibility.

Their body always consists of a head, trunk, and members.

The head is formed by the cranium, which contains the brain, and by the face, which is composed of two jaws and of the receptacles of the senses.

The trunk is supported by the spine and the ribs.

The spine is formed of vertebræ,—the first of which supports the head,—that move upon each other, and are perforated by an annular opening, forming together a canal, in which is lodged that medullary production from which arise the nerves, called the spinal marrow.

The spine, most commonly, is continued into a tail, extending beyond the posterior members.

The ribs are a kind of semicircular hoops which protect the sides of the cavity of the trunk; they are articulated at one extremity with the vertebræ, and most generally at the other with the sternum: sometimes, however, they do not encircle the trunk, and there are genera in which they are hardly visible.

There are never more than two pair of members, but sometimes one or the other is wanting, or even both. Their forms vary according to the movements they have to execute. The superior members are converted into hands, feet, wings or fins; and the inferior into feet or fins.

The blood is always red, and appears to be so composed as to sustain a peculiar energy of sentiment and muscular strength, but in various degrees, corresponding to their quality of respiration: from which originates the subdivision of the Vertebrata into four classes.

The external senses are always five in number, and reside in two eyes, two ears, two nostrils, the teguments of the tongue, and those of the body, generally. In some species, however, the eyes are obliterated.

The nerves reach the medulla through the foramina of the vertebræ or those of the cranium; they all seem to unite with this medulla, which, after crossing its filaments, spreads out to form the various lobes of which the brain is composed, and terminates in the two medullary arches called hemispheres, whose volume is in proportion to the extent of the intelligence.

There are always two jaws, the greatest motion is in the lower one, which rises and falls; the upper jaw is sometimes immoveable. Both of these are almost always armed with teeth, excrescences of a peculiar nature, which in their chemical composition are very similar to that of bone, but which grow by layers and transudation; one whole class, however, that of Birds, has the jaws invested with horn, which is also the case in the genus Testudo, in the class of Reptiles.

The intestinal canal traverses the body, experiencing various enlargements and contractions, having appendages, and receiving solvent fluids, one of which, the saliva, is discharged into the mouth. The others, which are poured into the intestine only, have various names: the two principal ones are the juices of the gland called the pancreas, and bile, a product of another very large gland named the liver.

While the digested aliment is traversing its canal, that portion of it which is fitted for nutrition, called the chyle, is absorbed by particular vessels styled lacteals, and carried into the veins; the residue of the nourishment of the parts is also carried into the veins by vessels analogous to these lacteals, and forming with them one same system called the *lymphatic system.*

The blood which has served to nourish the parts, and which has just been renewed by the chyle and lymph, is returned to the heart by the veins—but this blood is obliged, either wholly or in part, to pass into

the organ of respiration, in order to regain its arterial nature, previous to being again sent through the system by the arteries. In the three first classes this respiratory organ consists of lungs, that is, a collection of cells into which air penetrates. In Fishes only, and in some Reptiles, while young, it consists of branchiæ or a series of laminæ, between which water passes.

In all the Vertebrata, the blood which furnishes the liver with the materials of the bile is venous blood, which has circulated partly in the parietes of the intestines, and partly in a peculiar body called the *spleen*, and which, after being united in a trunk called the *venæ porta*, is again subdivided at the liver.

SUBDIVISION OF THE VERTEBRATA INTO FOUR CLASSES.

We have just seen how far vertebrated animals resemble each other; they present, however, four great subdivisions or classes, characterised by the kind or power of their motions, which depend themselves on the quantity of their respiration, inasmuch as it is from this respiration that the muscular fibres derive the strength of their irritability.

The quantity of respiration depends upon two agents: the first is the relative amount of blood which is poured into the respiratory organ in a given instant of time; the second is the relative amount of oxygen which enters into the composition of the surrounding fluid. The quantity of the former depends upon the disposition of the organs of circulation and respiration.

The organs of the circulation may be double, so that all the blood which is brought back from the various parts of the body by the veins is forced to circulate through the respiratory organ, previous to resuming its former course through the arteries; or they may be simple, so that a part only of the blood is obliged to pass through that organ, the remainder returning directly to the body.

The latter is the case with Reptiles. The quantity of their respiration, and all their qualities which depend on it, vary with the amount of blood thrown into the lungs at each pulsation.

Fishes have a double circulation, but their organ of respiration is formed to execute its function through the medium of water; and their blood is only acted on by the portion of oxygen it contains, so that the quantity of their respiration is perhaps less than that of reptiles.

In the Mammalia the circulation is double, and the aërial respiration simple, that is, it is performed in thelungs only; their quantity of respiration is, consequently, superior to that of Reptiles, on account of

the form of their respiratory organ, and to that of Fishes from the nature of their surrounding element.

The quantity of respiration in Birds is even superior to that of Quadrupeds, not only because they have a double circulation and an aërial respiration, but also because they respire by many other cavities besides the lungs, the air penetrating throughout their bodies, and bathing the branches of the aorta, as well as those of the pulmonary artery.

Hence result the four different kinds of motion for which the four classes of vertebrated animals are more particularly designed: *Quadrupeds*, in which the quantity of respiration is moderate, are generally formed to walk and run, both motions being characterised by precision and vigour; *Birds*, which have more of it, possess the muscular strength and lightness requisite for flight; *Reptiles*, where it is diminished, are condemned to creep, and many of them pass a portion of their lives in a kind of torpor; *Fishes*, in fine, to execute their motions, require to be supported in a fluid whose specific gravity is nearly as great as their own.

All the circumstances of organisation peculiar to each of these four classes, and those especially which regard motion and the external sensations, have a necessary relation with these essential characters.

The Mammalia, however, have particular characters in their viviparous mode of production, in the mammæ by which they suckle their young, &c.

The other classes, on the contrary, are oviparous; and if we compare them to the first, we shall find such numerous points of resemblance as announce a peculiar system of organization in the great general plan of the Vertebrata.

CLASS I.

MAMMALIA.

The Mammalia are placed at the head of the animal kingdom, not only because it is the class to which Man himself belongs, but also because it is that which enjoys the most numerous faculties, the most delicate sensations, the most varied powers of motion, and in which all the different qualities seem combined in order to produce a more perfect degree of intelligence—the one most fertile in resources, most susceptible of perfection, and least the slave of instinct.

As their quantity of respiration is moderate, they are designed in general for walking on the earth; but with vigorous and continued steps. The forms of the articulations of their skeleton are, consequently, strictly defined, which determines all their motions with the most rigorous precision.

Some of them, however, by means of limbs considerably elongated, and extended membranes, raise themselves in the air; others have them so shortened, that they can move with facility in water only, though this does not deprive them of the general characters of the class.

The upper jaw, in all these animals, is fixed to the cranium; the lower is formed of two pieces only, articulated by a projecting condyle to a fixed temporal bone; the neck consists of seven vertebræ, one single species excepted, which has nine; the anterior ribs are attached before, by cartilage, to a sternum consisting of several vertical pieces; their anterior extremity commences in a shoulder-blade that is not articulated, but simply suspended in the flesh, often resting on the sternum by means of an intermediate bone, called a clavicle. This extremity is continued by an arm, a fore-arm, and a hand, the latter being composed of two ranges of small bones called the carpus, of another range called the metacarpus, and of the fingers, each of which consists of two or three bones, termed phalanges.

With the exception of the Cetacea, the first part of the posterior extremity, in all animals of this class, is fixed to the spine, forming a girdle or pelvis, which, in youth, consists of three pair of bones; the ilium which is attached to the spine, the pubis which forms the anterior part of the girdle, and the ischium the posterior. At the point of union of these three bones is situated the cavity with which the thigh is articulated, to which, in its turn, is attached the leg, formed of two bones, the tibia and fibula; this extremity is terminated by parts similar to those of the hand, i. e. by a tarsus, metatarsus, and toes.

The head of the mammalia is always articulated by two condyles, with the atlas, the first vertebra of the neck.

The brain is always composed of two hemispheres, united by a medullary layer, called the *corpus callosum*, containing the ventricles, and enveloping four pair of tubercles, named the *corpora striata* or striated bodies, the *thalami, nervorum opticorum* or beds of the optic nerves, and the *nates* and *testes*. Between the optic beds is a third ventricle, which communicates with a fourth under the *cerebellum*, the crura of which always form a transverse prominence under the *medulla oblongata*, called the *pons Varolii*, or bridge of Varolius.

The eye, invariably lodged in its orbit, is protected by two lids and

a vestige of a third, and has its crystalline fixed by the ciliary processes —its sclerotic is simply cellular.

The ear always contains a cavity called the *tympanum*, or drum, which communicates with the mouth by the *Eustachian tube;* the cavity itself is closed externally by a membrane called the *membrana tympani*, and contains a chain of four little bones, named the *incus* or anvil, *malleus* or hammer, the *os orbiculare* or circular bone, and the *stapes* or stirrup; a vestibule, on the entrance of which rests the stapes, and which communicates with three semicircular canals; and, finally, a *cochlea*, which terminates by one canal in the vestibule, and by the other in the tympanum.

Their cranium is subdivided into three portions; the anterior is formed by the two frontal and ethmoidal bones, the middle by the two ossa parietalia and the os ethmoides, and the posterior by the os occipitis. Between the ossa parietalia, the sphenoidalis, and the os occipitis, are interposed the two temporal bones, part of which belongs properly to the face.

In the fœtus, the occipital bone is divided into four parts: the sphenoidal into two halves, which are again subdivided into three pair of lateral wings; the temporal into three, one of which serves to complete the cranium, the second to close the labyrinth of the ear, the third to form the parietes of the tympanum, &c. These bony portions, still more numerous in the earliest period of the fœtal existence, are united more or less promptly, according to the species, and the bones themselves finally become consolidated in the adult.

Their face consists of the two maxillary bones, between which pass the nostrils; the two intermaxillaries are situated before, and the two ossa palati behind them; between these descends the vomer, a bony process of the os ethmoides; at the entrance of the nasal canal are placed the ossa nasi; to its external parietes adhere the inferior turbinated bones, the superior ones which occupy its upper and posterior portion belonging to the os ethmoides. The jugal or cheek-bone unites the maxillary to the temporal bone on each side, and frequently to the os frontis; finally, the os unguis and pars plana of the ethmoid bone occupy the internal angle of the orbit, and sometimes a part of the cheek. In the embryo state these bones also are much more subdivided.

Their tongue is always fleshy, connected with a bone called the os hyoides, which is composed of several pieces, and suspended from the cranium by ligaments.

Their lungs, two in number, divided into lobes, and composed of an infinitude of cells, are always enclosed, without any adhesion, in a

cavity formed by the ribs and diaphragm and lined by the pleura; the organ of voice is always at the upper extremity of the trachea; a fleshy curtain, called the *velum palati,* establishes a direct communication between their larynx and nasal canal.

Their residence on the surface of the earth rendering them less exposed to the alternations of cold and heat, their body is but moderately covered with hair, and in such as inhabit warm climates, even this slight covering is somewhat rare.

The Cetacea, which live exclusively in water, are the only ones that are altogether deprived of it.

The young are nourished for some time after birth by milk, a fluid peculiar to animals of this class, which is produced by the mammæ at the time of parturition, and remains as long as it is necessary. It is from the *mammæ* that this class derives its name; and being a character peculiar to it, they distinguish it better than any other external characteristics.

DIVISION OF THE MAMMALIA INTO ORDERS.

The variable characters which form essential differences among the Mammalia are taken from the organs of touch, on which depends their degree of ability or address, and from their teeth, which determines the nature of their aliment; and are all closely connected, not only with every thing relative to the functions of digestion, but also with a multitude of other differences relating even to their intelligence.

The degree of perfection in their organs of touch is estimated by the number and the pliability of the fingers, and from the greater or less extent to which their extremities are enveloped by the nail or the hoof.

A hoof which completely envelopes the end of the toe, blunts its sensibility, and renders the foot incapable of seizing.

The opposite extreme is when a nail, formed of one single lamina, covers only one of the faces of the extremity of the finger, leaving the other possessed of all its delicacy.

The nature of the food is known by the grinders, to the form of which the articulation of the jaws universally corresponds.

To cut flesh, grinders are required to be as trenchant as a saw, and jaws fitting like scissors, having no other motion than a vertical one.

For bruising roots or grains, flat-crowned grinders are necessary, and jaws that have a lateral motion; in order that inequalities may always exist on the crown of these teeth, it is also requisite that their sub-

stance be composed of parts of unequal hardness, so that some may wear away faster than others.

Hoofed animals are all necessarily herbivorous, and have flat-crowned grinders, inasmuch as their feet preclude the possibility of their seizing a living prey.

Animals with unguiculated fingers are susceptible of more variety; their food is of all kinds, and independently of the form of their grinders, they differ greatly from each other in the pliability and delicacy of their fingers. There is one character with respect to these, which has immense influence on their dexterity, and greatly multiplies their powers; it is the faculty of opposing the thumb to the finger for the purpose of seizing minute objects, constituting what is properly called a *hand;* a faculty which is carried to its highest perfection in man, in whom the whole anterior extremity is free and capable of prehension.

These various combinations, which strictly determine the nature of the different mammalia, have given rise to the following orders:—

ORDER I.

BIMANA*.

MAN forms but one genus, and that genus the only one of its order. As his history is the more directly interesting to ourselves, and forms the point of comparison to which we refer that of other animals, we will speak of it more in detail.

We will rapidly sketch every thing that is peculiar in each of his organic systems, amidst all that he shares in common with other Mammalia; we will examine the advantages he derives from these peculiarities over other species; we will describe the principal varieties of his race and their distinguishing characters, and finally point out the natural order in which his individual and social faculties are developed.

PECULIAR CONFORMATION OF MAN.

The foot of man is very different from that of the monkey; it is large; the leg bears vertically upon it; the heel is expanded beneath; the toes are short,

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* Animals with two hands.



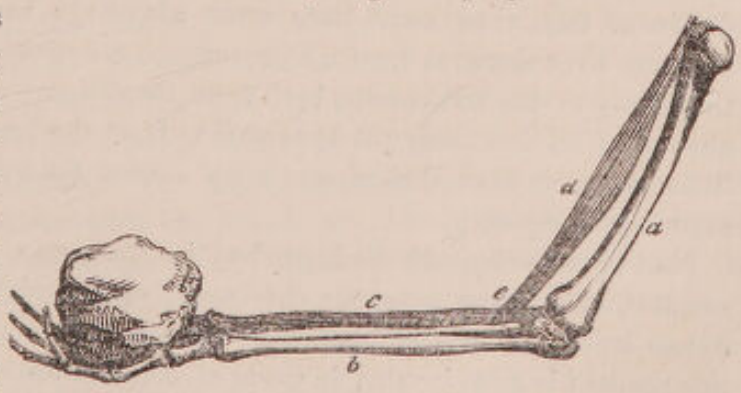
and but slightly flexible; the great toe, longer and larger than the rest, is placed on the same line with, and cannot be opposed to them. This foot, then, is peculiarly well adapted to support the body; but cannot be used for seizing or climbing, and as the hands are not calculated for walking, man is the only true bimanous and biped animal.

The whole body of man is arranged with a view to a vertical position. Were he to desire it, man could not, with convenience, walk on all-fours; his short and nearly inflexible feet, and his long thigh, would bring the knee to the ground; his widely separated shoulders and his arms, too far extended from the median line, would ill support the upper portion of his body. The great indented muscle, which, in quadrupeds, suspends the body between the scapulæ, as in a girth, is smaller in man than in any other animal. The head is also heavier, both from the magnitude of the brain and the smallness of the *sinuses* or cavities of the bones; and yet the means of supporting it are weaker, for he has neither a cervical ligament, nor are his vertebræ so arranged as to prevent their flexure forwards; the result of this would be, that he could only keep his head in the same line with the spine, and then his eyes and mouth being directed towards the earth, he could not see before him;—in the erect position, on the contrary, the arrangement of these organs is every way perfect.

The arteries which are sent to his brain, not being subdivided as in many quadrupeds, if the blood requisite for so voluminous an organ were carried into it with too much violence, frequent apoplexies would be the consequence of a horizontal position.

Man, then, is formed for an erect position only. He thus preserves the entire use of his hands for the arts, while his organs of sense are most favourably situated for observation.

These hands, which derive such advantages from their liberty, receive as many more from their structure. The thumb, longer in proportion than that of the monkey, increases its facility of seizing small objects. All the fingers, the annularis excepted, have separate movements, a faculty possessed by no other animal, not even by the monkey. The nail, covering one side only of the extremity of the finger, acts as a support to the touch, without depriving it of an atom of its delicacy. The arms to which these hands are



a represents the os humeri; *b* the *ulna*; *c* the *radius*; *d* a flexible cord or muscle, which by contraction from *e* elevates the weight in the hand.

attached, are strongly and firmly connected by the large scapula, the strong clavicle, &c.

Man, so highly favoured as to dexterity, is not at all so with respect to strength. His swiftness in running is greatly inferior to that of other animals of his size. Having neither projecting jaws, salient canine teeth, nor claws, he is destitute of offensive weapons; and the sides and upper parts of his body being naked, unprovided even with hair, he is absolutely without defensive ones. Of all animals, he is also the longest in attaining the power necessary to provide for himself.

This very weakness, however, is but one advantage more—it compels him to have recourse to that intelligence within, for which he is so eminently conspicuous.

No quadruped approaches him in the magnitude and convolutions of the hemispheres of the brain, that is, in the part of this organ which is the principal instrument of the intellectual operations. The posterior portion of the same organ extends backwards, so as to form a second covering to the cerebellum; the very form of his cranium announces this magnitude of the brain, while the smallness of his face shows how slightly that portion of the nervous system which influences the external senses predominates in him.

These external sensations, moderate as they all are in man, are nevertheless extremely delicate and well balanced.

His two eyes are directed forwards; he does not see on two sides at once, like many quadrupeds, which produces more unity in the result of his sight, and concentrates his attention more closely on sensations of this kind. The ball and iris of his eye vary but little; this restrains the activity of his sight to a limited distance, and a determinate degree of light. His external ear, possessing but little mobility or extent, does not increase the intensity of sounds, and yet, of all animals, he best distinguishes the various degrees of intonation. His nostrils, more complicated than those of the monkey, are less so than those of all other genera; and yet he appears to be the only animal whose sense of smell is sufficiently delicate to be affected by unpleasant odours. Delicacy of smell must have some influence on that of taste, and, independently of this, man must have some advantage in this respect over other animals, over those at least whose tongues are covered with scales. Lastly, the nicety of his tact results, both from the delicacy of his covering, and the absence of all insensible parts, as well as from the form of his hand, which is better adapted than that of any other animal for suiting itself to every little superficial inequality.

Man is pre-eminently distinguished in the organ of his voice; of all the mammalia, he alone possesses the faculty of articulating words, its probable causes being the form of his mouth and the great mobility of his lips. From this results his most invaluable mode of communication; for of all the signs which can be conveniently employed for the transmission of ideas, variations of sound are those which can be perceived at the greatest distance, and are the most extensive in their sphere of operation.

The whole of his structure, even to the heart and great vessels, appears

to have been framed with a view to a vertical position. The heart is placed obliquely on the diaphragm, and its point inclines to the left, thereby occasioning a distribution of the aorta, differing from that of most quadrupeds.

The natural food of man, judging from his structure, appears to consist of the fruits, roots, and other succulent parts of vegetables; his hands offer him every facility for gathering them; his short, and but moderately strong jaws on the one hand, and his canini being equal in length to the remaining teeth, and his tubercular molares on the other, would allow him neither to feed on grass nor to devour flesh, were these aliments not previously prepared by cooking. Once possessed of fire, however, and those arts by which he is aided in seizing animals or killing them at a distance, every living being was rendered subservient to his nourishment, thereby giving him the means of an infinite multiplication of his species.

To complete the hasty sketch of the anatomical structure of man requisite for this introduction, we will add, that he has thirty-two vertebræ, of which seven belong to the neck, twelve to the back, five to the loins, five to the sacrum, and three to the coccyx. Seven pairs of his ribs are united to the sternum by elongated cartilages, and are called true ribs; the five following pairs are denominated false ones. The adult cranium is formed of eight bones; an occipitalis, two ossa temporis, two parietalia, and the frontal, ethmoidal, and sphenoidal bones. The bones of his face are fourteen in number; two maxillaries, two ossa malæ, each of which joins the temporal to the maxillary bone of its own side by a kind of handle called the zygomatic arch; two nasal bones, two ossa palati behind the palate, a vomer between the nostrils, two turbinated bones of the nose in the nostrils, two lachrymals (unguis) in the internal angles of the orbits and the single bone of the lower jaw. Each jaw has sixteen teeth; four cutting incisors in the middle, two pointed canines at the corners, and ten tuberculated molares, five on each side. At the extremity of the spine of his scapula, is a tuberosity called the acromion, to which the clavicle is attached, and over its articulation is a point called the coracoid process, with which certain muscles are connected. The radius revolves upon the ulna, owing to the mode of its articulation with the humerus. The carpus has eight bones, four in each range; the tarsus has seven; those of the remaining parts of the hand and foot may be easily counted by the number of fingers and toes.



PHYSICAL AND MORAL DEVELOPMENT OF MAN.

Scarcely has the body gained the full period of its growth in height, before it begins to increase in bulk; fat accumulates in the cellular tissue, the different

vessels become gradually obstructed, the solids become rigid, and, after a life more or less long, more or less agitated, more or less painful, old age arrives with decrepitude, decay, and death. Man rarely lives beyond a hundred years, and most of the species, either from disease, accident, or infirmity, perish long before that term.

The child requires the assistance of its mother long after it has ceased to derive its nourishment from her; from her it obtains an education both moral and physical, and a mutual attachment is created that is fervent and durable. The nearly equal number of the two sexes, and the difficulty of supporting more than one wife, prove that monogamy is the mode of union most natural to our species. From the long period of infantile weakness springs domestic subordination, and the order of society in general, as the young people who compose the new families continue to preserve with their parents those tender relations to which they have so long been accustomed. This disposition to mutual assistance multiplies to an almost unlimited extent those advantages previously derived by insulated man from his intelligence; it has assisted him to tame or repulse other animals, to defend himself from the effects of climate, and thus enabled him to cover the earth with his species.

In other respects, he appears to possess nothing resembling instinct, no regular habit of industry produced by innate ideas; his knowledge is the result of his sensations and of his observations, or of those of his predecessors. These transmitted by speech, increased by meditation, and applied to his necessities and his enjoyments, have originated all the arts of life. Language and letters, by preserving acquired knowledge, are a source of indefinite perfection to his species. It is thus he has acquired ideas, and made all nature contribute to his wants.

There are very different degrees of development, however, in man.

The first hordes, compelled to live by fishing and hunting, or on wild fruits, and being obliged to devote all their time to search for the means of subsistence, and not being able to multiply greatly, because that would have destroyed the game, advanced but slowly. Their arts were limited to the construction of huts and canoes, to covering themselves with skins, and the fabrication of arrows and nets. They observed such stars only as directed them in their journeys, and some few natural objects whose properties were of use to them. They domesticated the dog, simply because he had a natural inclination for their own kind of life. When they had succeeded in taming the herbivorous animals, they found in the possession of numerous flocks a never-failing source of subsistence, and also of some leisure, which they employed in extending the sphere of their acquirements. Some industry was then employed in the construction of dwellings and the making of clothes: the idea of property was admitted, and consequently that of barter, as well as wealth and the difference of conditions, those fruitful sources of the noblest emulation and of the vilest passions: but the necessity of searching for fresh pastures, and of obeying the changes of the seasons, still doomed them to a wandering life, and limited their improvements to a very narrow sphere.

The multiplication of the human species, and their improvements in the arts and sciences, have only been carried to a high degree since the invention of agriculture and the division of the soil into hereditary possessions. By means of agriculture, the manual labour of a portion of society is adequate to the maintenance of the whole, which allows the remainder time for less necessary occupations, at the same time that the hope of acquiring, by industry, a comfortable existence for himself and posterity, gives a new spring to emulation. The discovery of a representative of property, or a circulating medium, by facilitating exchanges and rendering fortunes more independent and susceptible of being increased, has carried this emulation to its highest degree, but by a necessary consequence it has also equally increased the vices of effeminacy and the furies of ambition.

The natural propensity to reduce every thing to general principles, and to search for the causes of every phenomenon, has produced reflecting men, in every stage of society, who have added new ideas to those already obtained, nearly all of whom, while knowledge was confined to the few, endeavoured to convert their intellectual superiority into the means of domination, by exaggerating their own merit, and disguising the poverty of their knowledge by the propagation of superstitious ideas.

An evil still more irremediable, is the abuse of physical power: now that man only can injure man, he is continually seeking to do so, and is the only animal upon earth that is for ever at war with his own species. Savages fight for a forest, and herdsmen for a pasture, and, as often as they can, break in upon the cultivators of the earth, to rob them of the fruits of their long and painful labours. Even civilised nations, far from being contented with their blessings, pour out each other's blood for the prerogatives of pride, or the monopoly of trade. Hence, the necessity for governments to direct the national wars, and to repress or reduce to regular forms, the quarrels of individuals.

The social condition of man has been restrained, or advanced, by circumstances more or less favourable.

The frozen climates of the north of both continents, and the impenetrable forests of America, are still inhabited by the savage hunter or fisherman. The immense plains of sand and salt found in central Asia and Africa are inhabited by a pastoral people, and innumerable herds. These half-civilised hordes assemble at the call of every enthusiastic chief, and rush like a torrent on the cultivated countries that surround them, in which they establish themselves, to be weakened by luxury, and in their turn to become the prey of others. This is the true cause of that despotism which has always crushed and destroyed the industry of Persia, India, and China.

Mild climates, soils naturally irrigated and rich in vegetables, are the cradles of agriculture and civilisation, and when so situated as to be sheltered from the incursions of barbarians, every species of talent is excited; such were Italy and Greece, and such is, at present, nearly all the happy portion of the earth.

VARIETIES OF THE HUMAN SPECIES.

Three races appear very distinct—the *Caucasian* or white, the *Mongolian* or yellow, and the *Ethiopian* or negro.

The Caucasian, to which we belong, is distinguished by the beauty of the oval formed by his head, varying in complexion and the colour of the hair. To this variety the most highly civilised nations, and those which have generally held all others in subjection, are indebted for their origin.

The Mongolian is known by his high cheek bones, flat visage, narrow and oblique eyes, straight black hair, scanty beard, and olive complexion. Great empires have been established by this race in China and Japan, and their conquests have been extended to this side of the Great Desert. In civilisation, however, it has always remained stationary.

The Negro race is confined to the south of Mount Atlas; it is marked by a black complexion, crisped or woolly hair, compressed cranium, and a flat nose. The projection of the lower parts of the face, and the thick lips, evidently approximate it to the monkey tribe; the hordes of which it consists have always remained in the most complete state of utter barbarism.

The race from which we are descended has been called *Caucasian*, because tradition and the filiation of nations seem to refer its origin to that group of mountains situated between the Caspian and Black seas, whence, as from a centre, it has been extended like the radii of a circle. Various nations in the vicinity of Caucasus, the Georgians and Circassians, are still considered the handsomest on the earth. The principal ramifications of this race may be distinguished by the analogies of language. The Armenian or Syrian branch, stretching to the south, produced the Assyrians, the Chaldeans, the hitherto untameable Arabs, who, after the time of Mahomet, were near becoming masters of the world; the Phenicians, Jews, and Abyssinians, which were Arabian colonies; and most probably the Egyptians. From this branch, always inclined to mysticism, have sprung the most widely extended forms of religion—the arts and literature have sometimes flourished among its nations, but always enveloped in a strange disguise and figurative style.

The Indian, German, and Pelasgic branch is much more extended, and was much earlier divided, notwithstanding which, the most numerous affinities may be observed between its four principal languages—the Sanscrit, the present sacred language of the Hindoos, and the parent of the greater number of the dialects of Hindostan; the ancient language of the Pelasgi, the common mother of the Greek, the Latin, many tongues that are now extinct, and of all those of the south of Europe; the Gothic or Teutonic, from which are derived the languages of the north and north-west of Europe, such as the German, the Dutch, English, Danish, Swedish, and other dialects; and finally, the Sclavonian, from which spring those of the north-east, the Russian, Polish, and Bohemian, &c.

It is by this great and venerable branch of the Caucasian stock, that philosophy, the arts, and the sciences have been carried to the greatest perfection, and

remained in the keeping of the nations which have composed it for more than three thousand years.

It was preceded in Europe by the Celts, who came from the north, and whose tribes, once very numerous, are now confined to its most eastern extremity; also by the Cantabrians, who passed from Africa into Spain, and are now confounded with the many nations whose posterity have intermingled in that peninsula.

The ancient Persians originate from the same source as the Indians, and their descendants to the present hour bear great marks of resemblance to the people of Europe.

The predatory tribes of the Scythian and Tartar branch, extending at first to the north and north-east, always wandering over the immense plains of those countries, returned only to devastate the happier abodes of their more civilised brethren. The Scythians, who, at so remote a period, made irruptions into Upper Asia; the Parthians, who there destroyed the Greek and Roman domination; the Turks, who there subverted that of the Arabs, and subjugated in Europe the unfortunate remnant of the Grecian people,—all swarmed from this prolific branch. The Finlanders and Hungarians are tribes of the same division, which have strayed among the Sclavonic and Teutonic nations. Their original country, to the north and north-east of the Caspian Sea, still contains inhabitants who have the same origin, and speak similar languages, but mingled with other petty nations, variously descended, and of different languages. The Tartars remained unmixed longer than the other nations included in the country between the mouth of the Danube to beyond the Irtisch, from which they so long menaced Russia, and where they have been finally subjugated by her. The Mongoles, however, have mingled their blood with that of those they conquered, many traces of which may still be found among the inhabitants of Lesser Tartary.

It is to the east of this Tartar branch of the Caucasian that the Mongolian race begins, whence it extends to the Eastern Ocean. Its branches, the Calmucs, &c., still wandering shepherds, are constantly traversing the desert. Thrice did their ancestors, under Attila, Genghis, and Tamerlane, spread far the terror of their name. The Chinese are the earliest and most civilised branch not only of this race, to which they belong, but of all the nations upon earth. A third branch, the Mantchures, recently conquered, and still govern China. The Japanese, Coreans, and nearly all the hordes which extend to the north-east of Siberia, subject to Russia, are also to be considered, in a great measure, as originating from this race; and such also is esteemed to be the case with the original inhabitants of various islands of that archipelago. With the exception of a few Chinese literati, the different nations of the Mongoles are universally addicted to Buddism, or the religion of Fo.

The origin of this great race appears to have been in the mountains of Atlai, but it is impossible to trace the filiation of its different branches with the same certainty as we have done those of the Caucasian. The history of these wandering nations is as fugitive as their establishments; and that of the

Chinese, confined exclusively to their own empire, gives us nothing satisfactory with respect to their neighbours. The affinities of their languages are also too little known to direct us in this labyrinth.

The languages of the north of the peninsula beyond the Ganges, as well as that of Thibet, are somewhat allied to the Chinese, at least in their monosyllabic structure, and the people who speak them have features somewhat resembling other Mongoles. The south of this peninsula, however, is inhabited by Malays, whose forms approximate them much nearer to the Indians, whose race and language are extended over all the coasts of the islands of the Indian Archipelago. The innumerable little islands of the Southern Ocean are also peopled by a handsome race, nearly allied to the Indians, whose language is very similar to the Malay; in the interior of the largest of these islands, particularly in the wilder portions of it, is another race of men with black complexions, crisped hair, and negro faces, called Alfourous. On the coast of New Guinea, and in the neighbouring islands, we find other negroes, nearly similar to those of the eastern coast of Africa, named Papuas; to the latter are generally referred the people of Van Diemen's Land, while those of New Holland are referred to the Alfourous.

The Malays and the Papuas are not easily referable to either of the three great races of which we have been speaking; but can the former be clearly distinguished from their neighbours, the Caucasian Hindoos and the Mongolian Chinese? As for us, we confess we cannot discover any sufficient characteristics in them for that purpose. May not the Papuas be Negroes, which have formerly strayed into the Indian Ocean? We posssess neither figures nor descriptions sufficiently precise to enable us to answer this question.

The northern inhabitants of both continents, the Samoïèdes, the Laplanders, and the Esquimaux, spring, according to some, from the Mongolian race, while others assert that they are mere degenerate offsets from the Scythian and Tartar branch of the Caucasian stock.

We have not yet been able to refer the Americans to any of the races of the eastern continent; still they have no precise nor constant character which can entitle them to be considered as a particular one. Their copper-coloured complexion is not sufficient; their generally black hair and scanty beard would induce us to refer them to the Mongoles, if their defined features, projecting nose, large and open eye, did not oppose such a theory, and correspond with the features of the European. Their languages are as numberless as their tribes, and no demonstrative analogy has as yet been obtained, either with each other, or with those of the Old World.

ORDER II.

QUADRUMANA *.



Independently of the anatomical details which distinguish it from Man, and which have been given, this family differs from our species in a very remarkable way. All the animals belonging to it, have the toes of the hind feet free and opposable to the others, and the toes are all as long and flexible as fingers. In consequence of this, the whole species climb trees with the greatest facility, while it is only with pain and difficulty they can stand and walk upright, their foot then resting on its outer edge only, and their narrow pelvis being unfavourable to an equilibrium. They all have intestines very similar to those of man; the eyes directed forwards.



Interior of the head of a monkey.

The brain has three lobes on each side, the posterior of which covers the cerebellum, and the temporal fossæ are separated from the orbits by a bony partition. In every thing else, however, they gradually lessen in resemblance to man, by assuming a muzzle more and more elongated, a tail, and a gait more like that of quadrupeds. Notwithstanding this, the freedom of their arms and the complication of their hands allow them all to perform many of the actions of man as well as to imitate his gestures.

They have long been divided into two genera, the *Monkeys* and the *Lemurs*, which, by the multiplication of secondary forms, have now become two small families, between which we must place a third genus, that of the *Ouistitis*, as it is not conveniently referable either to the one or the other.

Simia, Lin.



The Monkeys are all quadrumana, which have four straight incisors in each jaw, and flat nails on all the extremities; two characters which approximate them more nearly to Man than the subsequent genera: their molares have also blunt tubercles like ours, and their food consists chiefly of fruits. Their canine teeth, however, being longer than the rest, supply them with weapons which we do not possess, and which require a hollow in the opposite jaw, to receive them when the mouth is closed.

* Animals with four hands.

They may be divided, from the number of their molar teeth, into two principal subgenera, which are again subdivided into numerous groups. The

MONKEYS, *properly so called,*

Or those of the eastern continent, have the same number of grinders as Man, but otherwise differing from each other by characters, which have formed the grounds of the following subdivisions.

SIMIA, *Erxl.*—PITHECUS, *Geoff.*

The Ourangs* are the only monkeys of the ancient continent which have no callus on the seat. Their nose is not prominent, they have no cheek-pouches, nor a vestige of a tail. Some of them have arms long enough to reach the ground when standing—their legs, on the contrary, are very short.

S. satyrus, L. (The Ourang-Outang.) Of all animals, this Ourang is considered as approaching most nearly to Man in the form of his head, height of forehead, and volume of brain; but the exaggerated descriptions of some authors respecting this resemblance, are partly to be attributed to the fact of their being drawn from young individuals only; and there is every reason to believe, that with age, their muzzle becomes much more prominent. The body is covered with coarse red hair, the face bluish, and the hinder thumbs very short compared with the toes. The lips are susceptible of a singular elongation, and possess great mobility. His history has been much disfigured by mingling it with that of the other great monkeys, that of the Chimpansé in particular. After a strict and critical examination, I have ascertained that the Ourang-Outang inhabits the most eastern countries only, such as Malabar, Cochin-China, and particularly the great island of Borneo, whence he has been occasionally brought to Europe by the way of Java. When young, and such as he appears to us in his captivity, he is a mild and gentle animal, easily rendered tame and affectionate; he is enabled by his conformation to imitate many of our actions, but his intelligence does not appear to be so great as is reported, not much surpassing that of the Dog.

There is a monkey in Borneo, hitherto known only by his skeleton, called the *Pongo*, which so closely resembles the Ourang-Outang in the proportions of all his parts, that we are tempted to consider him an adult—if not of the species of the Ourang-Outang, at least of one very nearly allied to it. He is the largest monkey known, and in size is nearly equal to Man.

The arms of the remaining Ourangs reach only to the knee. They have no forehead, and the cranium retreats from the crest of the eye-brow. The name of CHIMPANSES might exclusively be applied to them.

S. Troglodytes, L. (The Chimpansé) is covered with black or brown hair.

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* *Orang* is a Malay word signifying *reasonable being*, which is applied to man, the ourang-outang, and the elephant. *Outang* means *wild*, or *of the woods*; hence, Wild Man of the Woods.

Could any reliance be placed on the accounts of travellers, this animal must be equal or superior to man in stature, but no part of it hitherto seen in Europe indicates this extraordinary size. It inhabits Guinea and Congo, lives in troops, constructs huts of leaves and sticks, arms itself with clubs and stones, and thus repulses men and elephants. Naturalists have generally confounded it with the Ourang-Outang. When domesticated, he soon learns to walk, sit and eat like a man. We now separate the Gibbons from the Ourangs.

HILOBATES, *Illig.*

The Gibbons have the long arms of the true Ourangs, and the low forehead of the Chimpansé, along with the callous seat of the Guenons, differing, however, from the latter in having no tail or cheek-pouch. They all inhabit the most remote parts of India.

S. lar., L. (The Black Gibbon) is covered with coarse black hairs, and has a whitish circle round his face. There are three other species of the Gibbons mentioned:—*H. Agalis* of F. Cuv.; *S. Leucisca*, Schrib.; and *S. Syndactila*, F. Cuv.; the latter has the second and third toes of the hind foot united by a narrow membrane, the whole length of the first phalanx.

CERCOPITHECUS, *Erxl.*

The long-tailed monkeys have a moderately prominent muzzle (of about 60°); cheek-pouches; tail; callosities on the seat; the last of the inferior molares with four tubercles like the rest. Numerous species, of every variety of size and colour, abound in Africa, they live in troops, and do much damage to the gardens and fields under cultivation. They are easily tamed, and several of the species are small and beautifully variegated in colour, and of a mild and gentle disposition.

Simia rubra, Gm. (The Patras.) Red fawn colour above, whitish below; a black band over the eyes, sometimes surmounted with white—from Senegal. The

SEMNOPITHECUS, *Fred. Cuv.*

Differs from the long-tailed monkeys, by having an additional small tubercle on the last of the inferior molares. These animals inhabit eastern countries, and their long limbs and very long tail give them a very peculiar appearance. Their muzzle projects very little more than that of the Gibbons, and, like them, they have callosities on the seat. They appear, likewise, to have no cheek pouches; their larynx is furnished with a sac. The one longest known is the

Sim. nemæus, L. Remarkable for its lively and varied colouring; body and arms grey; hands, thighs, and feet black; legs of a lively red; the tail and a large triangular spot upon the loins, white; face orange; he has a black and red collar, and tufts of yellow hairs on the sides of the head; inhabits Cochin China. Another species, *S. nasica*, is remarkable for the very extraordinary form of its nose, which is extremely long and projecting. This monkey inhabits Borneo, where they live in large troops, assembling every morning and evening on trees growing on the banks of the rivers; its cry resembles the words kah an, from which it is named.

MACACUS, OR MACAQUES.



All the animals of this denomination have a fifth tubercle on their last molars, and callosities and cheek pouches like a Guenon. The limbs are shorter and thicker than in a Semnopithecus; the muzzle more projecting, and the superciliary ridge more inflated than in either the one or the other. Though docile when young, they become unmanageable when old. They all have a sac which communicates with the larynx under the thyroid cartilage, and which, when they cry out, becomes filled with air. Their tail is pendent, and takes no part in their motions; they produce early, but are not completely adult for four or five years.

Sim. silenus and *leonina*, L. (The Maned Macaque.) Black; ash-coloured mane and whitish beard, which surround the head. From Ceylon.

Some of the Macaques are distinguished by a short tail.

M. rhesus. (The Pig-tailed Baboon.) Greyish; a fawn-coloured tinge on the head and crupper, sometimes on the back; face flesh-colour; tail reaching below the hamstrings. From Bengal.

INUUS, *Cuv.*

The Inui are mere Macaques, which have a small tubercle in lieu of a tail.

CYNOCEPHALUS, C. *

The Dog-headed Monkeys, together with the teeth, cheek-pouches, and callosities of the Inuus, Cuv., have an elongated muzzle truncated at the end, in which the nostrils are pierced, giving it a greater resemblance to that of a dog than of any other monkey; their tail varies in length. They are generally large, ferocious, and dangerous animals; found mostly in Africa.

C. papia, Desm. (The Guinea Baboon.) Yellow, verging more or less on a brown; tufts of the cheeks fawn-coloured; face black; tail long. They are found of various sizes, owing probably to the difference of age. When full grown, they are frightful from their ferocity and brutality. From Guinea. There is another species, *S. nigra*, Cuv., which should be distinguished from other Cynocephala; it is totally black, and without a tail, but the head resembles that of the other species. The

MANDRILLS,

Of all the monkeys, have the longest muzzle (30°); their tail is very short; they are brutal and ferocious; nose as in the preceding.

Sim. maimon and *mormon*, Lin. (The Mandril.) Greyish brown, inclining to olive above; cheeks blue and furrowed. The nose in the adult male becomes red, particularly at the end, where it is scarlet, which has been the

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* *Cynocephalus*, dog's head.

cause of its being deemed, erroneously, a distinct species. It is difficult to imagine a more hideous or extraordinary animal. He nearly attains the size of a man, and is a terror to the negroes of Guinea. Many details of his history have been mixed up with that of the Chimpansé, and consequently with that of the Ourang-Outang.

The Monkeys of America

Have four grinders more than the others—thirty-six in all; the tail long; no cheek-pouches; seat hairy; no callosities; nostrils opening on the sides of the nose, and not underneath. All the great Quadrumana of America belong to this division. The tails of some of them are prehensile—that is, their extremity can twist round a body with sufficient force to seize it as with a hand. They are more particularly designated by the name of Sapajous.





At their head may be placed the Alouattes (Mycetes, Illig.), which are distinguished by a pyramidal head, the upper jaw of which descends much below the cranium, as the branches of the lower one ascend very high for the purpose of lodging a bony drum, formed by a vesicular inflation of the hyoid bone, which communicates with the larynx, and gives to their voice astonishing power, and a most frightful sound. Hence their name of *Howling Monkeys*. The prehensile portion of the tail is naked beneath.

There are several species, whose distinguishing characters are not yet well ascertained, for the colour of the fur on which they are established varies with the age and sex.

Simia seniculus, Buff. (Red Howling Monkey.) It is often sent to us from the forests of Guiana, where it lives in troops; size that of a large fox; colour, a reddish chesnut, rather deeper at the head and tail.

The Common Sapajous have the head flat, and the projection of the muzzle very moderate—facial angle 60°.

In some of them, the anterior thumbs are either totally, or nearly, hidden under the skin, and the prehensile part of the tail naked beneath. M. Geoffroy has formed them into a genus by the name of Ateles.

Lagothrix, *Geoff.*—Gastrimargus, *Spix.*

Head round, a thumb like the Alouattes; tail partly naked. Such are the *L. Humboldii*, Geoff., the Capparo, and the Grison or the Silver-haired Monkey; monkeys from the interior of South America, said to be remarkable gluttons.

The other Sapajous have a round head, distinct thumbs, and the tail, hairy, though prehensile. The species are more numerous than those of the Alouatte, and are characterised with nearly as much difficulty. Some of them have the hairs on the forehead of a uniform length, such as the

Sim. appella, L. (The Sajou); and the *S. capucina*, L. (The Capuchin.)

Both of them are of different browns; in the first, the circumference of the face is blackish; in the second it is whitish; but the shade of colour in all the rest of their bodies varies between a brownish black and a fawn colour, sometimes even a white. The shoulders and breast are, however, generally lighter, and the calotte and hands darker.

Others, again, have the hairs of the forehead so disposed as to form a kind of aigrette, such as the

Sim. fatuellus, Gm. (The Horned Sajou.) This animal has a tuft of black hairs on each side of the forehead.

The dispositions of those Monkeys are mild and gentle, their motions quick and light, and they are easily tamed. Their name of *Weeping Monkeys* is derived from their soft plaintive voice.

In the SAIMIRI the tail is depressed, and almost ceases to be prehensile; the head is very much flattened; in the interorbital partition of the skeleton there is a membranous space. There is only one known; the

Simia sciurea, Buff. (The Saimiri.) Size of a Squirrel; of a yellowish grey; fore-arms, legs, and the four extremities, of a yellowish fawn-colour; end of the nose black.

Those of the *American* monkeys, whose tails are not at all prehensile, are called SAKIS. Several of them have that appendage long and tufted, whence they have been also termed Fox-tailed Monkeys: their teeth project forwards more than those of the others. They are the PITHECIA of Desmarets and Illiger.

Simia pithecia, L. (The Yarke.) Blackish; circumference of the face whitish.

Spix distinguishes those species whose tails, although tufted, are shorter than the body, by the name of BRACHIURUS. His *Br. Ouaraki* has a fawn-coloured body; head, neck, arms, and feet black.

In some, also, the *Callithrix*, Geoff., or *Sagouins*, Fr. Cuv., the tail is slender, and the teeth do not project. The Saimiri were associated with them for a long time, but the head of the Sagouins is higher, and their canine teeth much shorter. Such is the

Call. personata, Geoff. (The Masked Monkey.) A yellowish grey; head and hands black. The

NOCTHORUS, Fred. Cuv.

Only differs from the Sagouins in its great nocturnal eyes, and in the ears, which are partly hidden under the hair. One species only is known,—

Nocth. triirgata, Fred. Cuv. (The Douroucouli.) Ash-coloured above, yellowish beneath; a black vertical line on the middle of the forehead, and one on each temple. It is a nocturnal animal of South America.

They are all from Guiana or Brazil.

Ouistitis.





A small genus, similar to the Sakis, and for a long time confounded with them in the great genus of monkeys. In fact, like the generality of the American monkeys, they have the head round; visage flat; nostrils lateral; no cheek-pouches; and, like the Sakis in particular, the tail is not prehensile. They have only, however, twenty grinders, like the monkeys of the eastern continent; all their nails are compressed and pointed, those of the hind thumbs excepted, while their anterior ones are so slightly separated from the fingers, that it is with hesitation we assign to them the name of quadrumana. They are pretty little creatures, of agreeable forms, and easily tamed. The engraving represents the head and feet of the *Ouistitis*, properly so called, which M. Geoffroy names Jacchus, and whose peculiar characters are pointed inferior incisors, arranged on a curved line, equal to the canines. Their tail is curling and well covered with hairs; the ears generally ornamented with a tuft.

Sim. jacchus, Linnæus; the Common Ouistitis. The tail is tolerably well tufted, coloured in rings of brown and white; body greyish-brown; two large tufts of white hairs before the ears. This species is found in Paraguay, and nearly every part of South America.

Lemur, *Linnæus.*

The Lemurs, according to Linnæus, comprehend all the Quadrumana which have in either jaw incisors differing in number from four, or at least differently directed from those of the Monkeys. This negative character could scarcely fail to embrace very different beings, while it was not calculated to even unite those which should be combined. Geoffroy has established several divisions in this genus which are much better characterised. The four thumbs of these animals are well developed and opposable, and the first hind finger is armed with a pointed raised nail; all the other nails are flat. Their fur is woolly; and their teeth begin to exhibit sharp tubercles catching in each other as in the Insectivora. These peculiarities are represented in the engraving.





The Lemur Makis, properly so called, have six incisors in the lower jaw, compressed and slanting forwards, four in the upper that are straight, the intermediate ones being separated from each other; trenchant canini; six molares on each side above, six below; ears small. They are very active animals, which, from their pointed heads, have been called *Fox-nosed Monkeys*. Their food is fruit. Their species are very numerous, and are only met with in the island of Madagascar, where they appear to replace the Monkeys, none of which it is said are to be found there. Nearly all the difference that exists between them is in the colour.

INDRIS.—LICHANOTUS, *Illiger.*

Have teeth like the preceding, except that there are only four below. One species only is known; it has no tail; is three feet high; black; face grey; the *Lemur Indri* of Sonnerat, Voy. I. pl. 86. The inhabitants of Madagascar tame and train it like a dog for the chase.

LORIS STENOPS, *Illiger.*



The Lazy Monkeys, as they are called, have teeth like the Makis, the grinders excepted, the points of which are more acute; they have the short muzzle of a mastiff; body slender; no tail; large eyes; tongue rough.

They feed on insects, occasionally on small birds and quadrupeds, their gait is excessively slow, and mode of life nocturnal. Two species only are known, both of them from the East Indies: one is the *Lem. tardigradus*, L. (The Slow Loris, or Sloth of Bengal,) which is fawn-coloured grey, a brown streak along the back; two of the upper incisors are sometimes wanting. The slowness of gait, in this species, caused it to be mistaken for the sloth, in some cases. The second species is called the Slender Loris, *L. gracilis*, distinguished from the Slow Loris by having no streak down the back, and by being rather smaller.

GALAGO, *Geoffroy*—OTOLENEUS, *Illiger.*

Have the teeth and insectivorous regimen of the preceding; elongated tarsi, which produce a disproportion in the dimensions of their hind feet; a long tufted tail; large membranous ears and great eyes, which announce nocturnal habits.

There are several species known, all from Africa. It appears also that we should refer to them an animal of that country (*Lemur potto*, Gm.), whose gait is said to be as slow as that of the Loris and Sloths.

TARSIUS.

Elongated tarsi, and all the other details of form belonging to the preceding division; but the space between the molars and incisors is occupied by several shorter teeth; the middle superior incisors are lengthened, and resemble canini. The muzzle is very short, and the eyes still larger than those of the Galago. They are nocturnal animals, and feed on insects. From the Moluccas. *Lemur spectrum*, Pall.

ORDER III.

CARNARIA*.

This order consists of a considerable and varied assemblage of unguiculated quadrupeds, possessing like Man and the Quadrumana the three sorts of teeth,

* Flesh-eating animals.

but which have no opposable thumb to their fore-feet. Their food is animal, and the more exclusively so, as their grinders are the more trenchant. Such as have them wholly or partly tuberculous, take more or less vegetable aliment, and those in which they are bristled with points live principally on insects. The articulation of their lower jaw, being transversely directed and hinge-like, allows of no lateral motion; it can only open and shut.

Although the convolutions of the brain are still tolerably well marked, it has no third lobe, nor does it cover the cerebellum any more than in the following families; the orbit is not separated from the temporal fossa in the skeleton; the cranium is narrowed and the zygomatic arches widened and raised, in order to give more strength and volume to the muscles of their jaws. Their predominant sense is that of smell, and their pituitary membrane is generally spread over numerous bony laminæ. The fore-arm has still the power of revolving in nearly all of them, although with less facility than in the Quadrumana, and they never have the thumb of the anterior extremities opposed to the other toes. On account of the substantial nature of the aliment, and to avoid the putrefaction it would undergo by remaining too long in an elongated canal, their intestines are less voluminous, as represented below.

There is a great variety in their forms and in the details of their organisation, which produces analogous differences in their habits, to such an extent as makes it impossible to arrange their genera on one line, and compels us to form them into several families, which are variously connected by multiplied relations.

FAMILY I.

CHEIROPTERA.



This family still retains some affinity with the Quadrumana. Their distinguishing character consists in a fold of the skin, which, commencing at the sides of the neck, extends between their four feet and toes, supports them in the air, and even enables such of them to fly as have their hands sufficiently developed for that purpose. This disposition required strong clavicles and large scapulæ to give the necessary solidity to the shoulder, but it was incompatible with the rotation of the fore-arm, which would have diminished the force of the stroke requisite for flight. They have all four great canini, but the number of their incisors varies. They have long been divided into two genera, founded upon the extent of their organs of flight. The first of these, however, requires several subdivisions.

VESPERTILIO, *Linnæus.*

The arms, fore-arms and fingers of the *Bats* are excessively lengthened, forming, with the membrane that occupies their intervals, true wings, possessing

even a greater extent of surface than those of birds—they consequently fly very high, and with great rapidity. The thickness of their pectoral muscles is proportioned to the motions they have to execute, and there is a ridge in the middle of the sternum like that of Birds, to which they are attached. The thumb is short and armed with a claw, by which they are enabled to creep and to suspend themselves. Their hind feet are weak and divided into five toes, almost of equal length, armed with trenchant and pointed nails. Their eyes are excessively small, but their ears are frequently very large, and together with the wings form a vast membranous surface, which is almost naked, and so extremely sensible that it is probable they guide themselves through all the sinuosities of their labyrinths, even after their eyes have been plucked out, solely by the diversity of the impressions of the air. They are nocturnal, and in our climate pass the winter in a stupor. During the day they suspend themselves in obscure places. They generally produce two young ones at a birth, which cling to their mammæ, and whose size is considerable in proportion to that of the mother. This genus is very numerous, and offers many subdivisions. We must begin by separating from it the

PTEROPUS. *Brisson.*

Trenchant incisors in each jaw, and grinders with flat crowns, the food, consequently, consists chiefly of fruit, of which it destroys considerable quantities; it also successfully pursues birds and small quadrupeds. It is the largest Bat known, and the flesh is eaten. The membrane is deeply notched between the legs; it has hardly any tail; the index finger is but half the length of the medius, and has a third phalanx, and a little nail, which is wanting on the other bats; the muzzle is simple, the nostrils are widely separated, the ears of a middling size, and the tongue is bristled with points that curve backwards. It inhabits the East Indies.

They have never been found out of the south of Asia or the Indian Archipelago.

a. Without tails, and four incisors in each jaw.

P. edulis, Geoff. (The Black Rousette.) Blackish brown, deepest beneath, wings nearly four feet from tip to tip. From the Moluccas and the Straits of Sunda, where they are found in great numbers during the day suspended to the trees. Two other species, *P. vulgaris*, and the *P. rubecolles*, Geoff. inhabit the Mauritius.

b. With a small tail and four incisors in each jaw.

M. Geoffroy was the first who described this species of this subdivision. One of them grey and woolly, *Pter. Ægypticus*, is found in the caves of Egypt.

The Pteropi being taken away, we have the true BATS left, which are all insectivorous, and have three grinders on each side in each jaw, bristled with conical points, they are preceded by a variable number of false molars. Their index never has a nail, and, one subgenus excepted, the membrane is always extended between the two legs.

They should be divided into two principal tribes. The first has three ossified phalanges in the middle finger of the wing, but the remainder, including the index itself, consists of but two.

The tribe of true bats is now divided into numerous subgenera, such as *Molossus, Noctilio, Vampirus,* &c. &c., distinguished by the absence or presence of a tail, the fact of its being free above the membrane or involved in it, the presence of a membrane on the nose, number of incisors, &c. &c.

GALEOPITHECUS, *Pallas.*



The Galiopitheci differ generally from the Vespertilios, in the fingers, all armed with trenchant nails, which are not longer than the toes, so that the membrane which occupies their intervals, and extends to the sides of the tail, can only act as a parachute. The canini are denticulated and short like the molars. There are two upper denticular incisors widely separated from each other, below there are six, split into narrow strips like a comb; a structure altogether peculiar to this genus. The animals belonging to it are found in the Indian Archipelago, on the trees, among which they pursue Insects, and perhaps Birds. If we can judge by the injury the teeth sustain from age, they use fruit also.

One species only is well ascertained, the *Flying Lemur*. Fur greyish, red above, reddish below; spotted with stripes and various shades of grey when young. From the Molucca islands, Straits of Sunda, &c.

FAMILY II.

INSECTIVORA.



The animals of this family, like the Cheiroptera, have grinders studded with conical points, and lead a nocturnal or subterraneous life. Their principal food is Insects, and in cold climates many of them pass the winter in a torpid state. Unlike the Bats, they have no lateral membranes, although they always have clavicles. Their feet are short, and their motions feeble. In walking they all place the whole sole of the foot on the ground. They differ from each other by the relative position and proportions of their incisors and canini. The engraving represents the skeleton and stomach of a species of this family.



Some have long incisors in front, followed by other incisors and canini, all even shorter than the molars, a kind of dentition of which the Tarsiers, among the Quadrumana, have already given us an example, and which somewhat approximate these animals to the Rodentia. Others have large separated canini, between which are placed small incisors; the most usual

disposition of these parts among the Quadrumana and the Carnaria: these two systems of dental arrangement are found in genera, otherwise very similar in the covering, shape of the limbs, and mode of life.

Erinaceus, *Linnæus*.

The body of the *Hedgehog* is covered with spines instead of hairs. The skin of the back is furnished with such muscles, as, by inclining the head and feet towards the abdomen, enable the animal to shut himself up in it, as in a purse, presenting his spines on all sides to the enemy. The tail is very short, and there are five toes to each foot. There are six incisors in each jaw, the middle ones being the longest, and on each side three false molars, three bristled with points, and a small one studded with tubercles*.

E. Europæus, L.; Buff. (The Common Hedgehog.) Ears short; common in the woods and hedges; passes the winter in its burrow. To insects, which constitute its ordinary diet, it adds fruit, by which at a certain age its teeth become worn. The skin was formerly used to dress hemp.

Centenes, *Illiger*.

The body of the *Tenric* is covered with spines like the Hedgehog. It does not however possess the faculty of rolling itself so completely into a ball: there is no tail; the muzzle is very pointed, and the teeth are very different.



There are four or six incisors, and two great canini in each jaw. Behind the canini are one or two small teeth, and four triangular and bristled molars. Three species are found in Madagascar, the first of which has been naturalised in the Isle of France. It is a nocturnal animal, which passes three months of the year in a state of lethargy, although inhabiting the torrid zone. Brugière even assures us that it is during the greatest heats that they grow torpid.

Erinaceus ecaudatus, L. (The Tenric.) Covered with stiff spines; only four notched incisors below. It is the largest of the three, and exceeds the Hedgehog in size.

Cladobates, *Fr. Cuvier*.

This is a new genus from the Indian Archipelago. The teeth have much affinity with those of the hedgehog; their middle upper incisors, however, are proportionately shorter, and the four lower ones elongated; there is also no tubercular one behind. The animal is covered with hair, has a long shaggy tail, and, contrary to the habits of other Insectivora, climbs trees with the agility of a squirrel; the pointed muzzle, however, makes the animal easily distinguishable even at a distance.

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* Pallas has noted as an interesting fact, that the Hedgehog eats hundreds of Cantharides without inconvenience, while a single one produces the most horrible agony in the Dog and the Cat.

Sorex, *Linnæus.*

The *Shrews* are generally small, and covered with hair. Under this, and upon each flank, there is a small band of stiff, thickly set setæ, from between which oozes an odorous fluid, the product of a peculiar gland. The two middle upper incisors are hooked and dentated at their base, the lower ones slanting and elongated: five small teeth on each side follow the first, and two only the second. There are moreover in each jaw three bristled molars, and in the upper one the last is a small tuberculous tooth. This animal lives in holes which it excavates in the earth, and which it seldom leaves till evening; they live on worms and insects.

Sor. araneus, L. (The Common Shrew.) Grey above; ash-coloured beneath; tail square, and not so long as the body by one-third; teeth white; ears naked and exposed; common in the fields, &c. There are several other species, one of which (the Rat-tailed Shrew) the Egyptians were in the habit of embalming.

Mygale, *Cuvier.*

The *Desmans* differ from the Shrews in two very small teeth placed between the two great lower incisors, and in their two upper incisors which are flattened and triangular. Behind these incisors are six are seven small teeth and four bristled molars. Their snout is drawn out into a little flexible proboscis, which they keep constantly in motion. Their long tail, scaly and flattened on the sides, with their feet of five fingers all united by membranes, evidently proclaim them to be aquatic animals. Their eyes are very small, and they have no external ears.

Sorex moschatus, L. (The Russian Musk Rat.) Nearly as large as a Shrew; above blackish, beneath whitish; tail not so long as the body by one-fourth.

This species is very common along the rivers and lakes of Southern Russia, where it feeds on worms, the larva of insects, &c., which it easily draws out of the mud, by means of its flexible snout. Its burrow is usually in a bank commencing under water, and ascending so as to be above its level even in the greatest floods.

Chrysocheoris, *Lacepede.*

Animals of this genus, like those of the preceding one, have two incisors above and four below; but their grinders are long, distinct, and almost all shaped like triangular prisms. Their muzzle is short, broad, and recurved, and their fore feet have only three nails, of which the external, which is very large, much arcuated and pointed, serves them as a powerful instrument for excavating and piercing the earth; the others regularly decrease in size. The hind feet have five of an ordinary size. They are subterraneous animals, whose mode of life is similar to that of Moles. To enable them to dig the better, their fore-arm is supported by a third bone placed under the cubitus.

C. Asiaticus. (The Golden Mole.) A little smaller than the European Mole; no apparent tail; is the only known quadruped that presents any appearance of those splendid metallic tints which brighten and adorn so many birds, fishes, and insects. Its fur is a green, changing to a copper or bronze; there is no conch to the ear, and the eye is not perceptible.

Talpa, *Linnæus.*



No one is ignorant of this curious animal, the *Mole*, whose form so perfectly qualifies it for a subterraneous mode of life. A very short arm attached to a long scapula, supported by a powerful clavicle, and furnished with enormous muscles, sustains an extremely large hand, the palm of which is always directed either outwards or backwards; the lower edge of this hand is trenchant, the fingers are scarcely perceptible, but the nails in which they terminate are long, flat, strong and sharp. Such is the instrument employed by the Mole to tear the earth and throw it behind it. Its sternum, like that of Birds and Bats, has a process which gives to the pectoral muscles the size that is required for their functions. To pierce and raise up the earth, it makes use of its long pointed head, whose muzzle is armed at its extremity with a peculiar little bone, whose muscles are extremely powerful. There is even an additional bone in the cervical ligament. It has but little power behind, and moves as slowly above ground as it advances rapidly under it. Its sense of hearing is very acute, and the tympanum very large, although there is no external ear; its eyes are so small and so hidden by the hair, that for a long time their existence was positively denied. The jaws are weak, and the food consists of Worms, Insects, and some soft roots. There are six incisors above, and eight below. The canini have two roots, which causes them to partake of the nature of false molars; behind them are four false molars above and three below, after which are three bristled molars.

T. Europæa, L.; Buff. (The Common Mole.) Pointed muzzle, hair soft and black; individuals are found white, fawn-coloured and piebald—a vexatious animal in cultivated grounds.

Condylura, *Illiger.*



In the animals belonging to this genus, the two kinds of dentition peculiar to the Insectivora seem to be combined. In the upper jaw are two large triangular incisors, two extremely small and slender ones, and on each side a strong canine. In the lower one are four incisors slanting forwards, and a pointed but small canine. The superior false molars are triangular and separated, the inferior trenchant and denticulated.

In their feet and the whole of their exterior they resemble the Mole, but their tail is longer, and what more particularly serves to distinguish them from the former is, that their nostrils are surrounded with little movable cartilaginous points, which, when they separate, radiate like a kind of star, as represented in the engraving.

One species particularly is found in North America—*Sorex cristatus*, L. (The Radiated Mole) similar to the Mole of Europe, the nose excepted, but having a tail more than double the length of that of the latter.

Scalops, *Cuvier.*

Teeth very similar to those of the Desmans, except that the small or false molars are less numerous, the muzzle is simply pointed, like that of the Shrew; their hands are widened, armed with strong nails fitted to excavate the earth, and exactly similar to those of Moles: in fact their mode of life is the same; their eyes are equally small, and their ears quite as much hidden. The only species known is the

S. aquaticus. It appears to inhabit a great part of North America, along rivers, &c. Its external resemblance to the common Mole of Europe * is so great, that it is easy to mistake the one for the other.

FAMILY III.

CARNIVORA.

Although the term carnivorous is applicable to all unguiculated animals, not quadrumanate, that have three sorts of teeth, inasmuch as they all use more or less animal food, there are, however, many of them, the two preceding families especially, which are compelled by weakness and the conical tubercles of their grinders to live almost entirely on Insects. It is in the present family that the sanguinary appetite for flesh is joined to the force necessary to obtain it. There are always four stout, long, and separated canini, between which are six incisors in each jaw, the root of the second of the lower ones being placed a little more inwards than the others. The molars are either wholly trenchant, or have some blunted tuberculous parts, but they are never bristled with conical points.

These animals are so much the more exclusively carnivorous, as their teeth are the more completely trenchant, and the proportions of their regimen may be calculated from the extent of the tuberculous surface of their teeth, compared with that which is trenchant. The Bears, which can subsist altogether on vegetables, have nearly all their teeth tuberculated.

The anterior molars are the most trenchant; next comes a molar, larger than the others, usually furnished with a larger or smaller tuberculous heel;

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* It is the *Common Mole* of the United States.—Ed.

then follow one or two small teeth, that are perfectly flat. It is with these small teeth in the back part of the mouth that the dog chews the grass he sometimes swallows. We will call, with M. Fr. Cuvier, this large upper molar, and its corresponding one below, *carnivorous teeth;* the anterior pointed ones, *false molars;* and the posterior blunted ones, *tuberculous teeth.*

It is easy to conceive that those genera which have the fewest false molars, and whose jaws are the shortest, are those best adapted for biting.

It is upon these differences that the genera can be most surely established.

It is necessary, however, that the consideration of the hind foot should be added to them. Several genera, like those of the two preceding families,



in walking, or when they stand erect, place the whole sole of the foot on the ground, a fact proved by the total want of hair on that part of it. Others, and by far the greater number, walk on the ends of the toes, by raising up the tarsus. They are much swifter, and to this first difference are added many others of habits, and even of internal conformation. In both, the clavicle is a mere bony rudiment suspended in the muscles. The

PLANTIGRADA

Form this first tribe, in which the whole sole of the foot is placed on the ground in walking, a circumstance which gives them a greater facility in standing vertically upon their hinder feet. They partake of the slowness and nocturnal life of the Insectivora; most of those that inhabit cold countries pass the winter in a state of torpor. They all have five toes to each foot.

URSUS, *Linnæus.*



Bears have three large molars on each side in each jaw, altogether tuberculous, and of which the posterior upper, and the anterior lower, are the longest. They are preceded by a tooth a little more trenchant, which is one of the carnivorous teeth of this genus, and by a variable number of very small false molars, which are sometimes shed at a very early period. This almost frugivorous sort of dentition, is the reason why, notwithstanding their great strength, they seldom eat flesh unless from necessity.

They are large, stout-bodied animals, with thick limbs, and a very short tail: the cartilage of the nose is elongated and moveable. They excavate dens or construct huts, in which they pass the winter in a state of somnolency, more or less profound, and without food. It is in these retreats that the female brings forth her young.

The species are not easily distinguished by apparent characters. We have the

U. Arctos L. (The European Brown Bear), which has the forehead

convex, the fur browner, more or less woolly when young, and growing smoother with age. Some are greyish, others almost yellow, and a third kind is brown with shades bordering on silver; when young they have commonly a whitish collar, which in some varieties remains for life. Their haunts are lofty mountains, and the great forests of the North of Europe and great part of Asia.

U. Americanus, Gm. (The North American Black Bear.) A very distinct species, with a flat forehead, smooth and black fur, and fawn-coloured muzzle. We have always found the small teeth behind the canini more numerous in this bear than in the European species. Individuals have been seen that were entirely fawn-coloured. Its usual food is wild fruits; it devastates the fields, and, where fish is abundant, proceeds to the shores for the purpose of catching it. It is only for want of other aliment that it attacks quadrupeds. The flesh is held in great esteem. Various species are known, such as the Polar Bear, Thibet Bear, Malay Bear, and the Grisly-Bear. The East Indies also produce several species of bears, of a black colour, the most remarkable of these, the

U. labiatus. L. (the thick-lipped bear), has the cartilage of the nose dilated, the tip of the under lip elongated, both being moveable; the incisors being easily lost, it was long considered as a Sloth. This animal is a great favourite with Indian jugglers on account of its deformity.

Procyon, *Storr.*

The *Raccoons* have three back tuberculous molars, the superior of which are nearly square, and three pointed false molars in front, forming a continuous series to the canines, which are straight and compressed. The tail is long, but the remainder of the exterior is that of a bear in miniature. They rest the whole sole of the foot on the ground only when they stand still; when they walk, they raise the heel.

P. lotor. (The Raccoon). Greyish brown; muzzle white; a brown streak across the eyes; tail marked with brown and white rings. This animal is about the size of a badger, is easily tamed, and remarked for a singular habit of eating nothing it has not previously dipped in water. From North America—lives on eggs, birds, &c.

Ailurus, *Fred. Cuvier.*

The *Panda* appears to approximate to the Raccoon in its canini, and what is known of its other teeth; with this exception, that it has only one false molar. The head is short; tail long; walk plantigrade; five toes with retractile claws. One species only is known, the

A. refulgens, Fred. Cuv. Size of a large cat; fur soft and thickly set; above of the most brilliant cinnamon red; behind more fawn-coloured; beneath of a deep black. The head is whitish, and the tail marked with brown rings. From the north of India.

ICTIDES, *Valen.*

The *Benturong* is somewhat related to the Raccoon by its teeth, but the three upper back molars are much smaller and less tuberculous, the last one in each jaw particularly, which is very small and nearly simple. It is covered with long hair, and has a tuft at each ear. The tail is long, hairy, and has a propensity to curl, as if prehensile. From India, our species is

Ict. albifrons, Fr. Cuv. Grey; tail and sides of the muzzle black; size that of a large cat. From Bootan.

NASUA, *Storr.*

The *Coatis*, to the teeth, tail, nocturnal habit, and slow dragging gait of the Raccoon, add a singularly elongated and flexible snout. The feet are semi-palmate, notwithstanding which they climb trees. Their long claws are used for digging. They inhabit the warm climates of America, and their diet is nearly the same as that of the Marten of Europe.

Viverra nasua, L. (The Red Coati.) Reddish fawn colour; muzzle brown; tail with brown rings.

This is perhaps the only proper place for the singular genus of the KINKAJOUS or POTTO, Cuv. which, to a plantigrade walk, adds a long prehensile tail like that of the Sapajous, a short muzzle, a slender and extensible tongue, two pointed grinders before, and three tuberculous ones behind.

Only one species is known, the *Viverra caudivolvula*, Gm. From the warm parts of America and from the great Antilles, where it is called *Potto*; size of a polecat; hair woolly, and of a grey or yellowish brown; habits nocturnal; of a mild disposition, and lives on fruit, milk, honey, blood, &c.

MELES, *Storr.*

The *Badgers*, which Linnæus placed with the Raccoons in the genus Ursus, have a very small tooth behind the canine, then two pointed molars followed in the upper jaw by one that we begin to recognise as carnivorous from the trenchant vestige it exhibits on its outer side; behind this is a square tuberculous one, the largest of all. Below, the penultimate begins to show a resemblance to the inferior carnivorous teeth, but as there are two tubercles on its internal border as elevated as its trenchant edge, it acts as a tuberculous one; the last below is very small.

The slow movements of the badgers and their nocturnal habits are like those of the preceding animals; their tail is short, the toes are much enveloped in the skin, and they are otherwise peculiarly distinguished by a sac under the tail, from which oozes a fat, fœtid humour. The long claws of their fore-feet enable them to dig with great effect.

M. Europæa. (The European Badger.) Greyish above, black beneath, a blackish band on each side of the head*.

* The American Badger. Mel. Hudsonius is a different species.—*M. Labradoria*; American badger, as will be seen from the description. Above grey, beneath paler; head brown, with a narrow white line on the top under jaw and throat white."—ED.

GULO, *Storr.*

Linnæus also placed the *Gluttons* among the bears, but they approximate much nearer to the weasels in their teeth as well as in their habits, the only relation they have to the former consisting in their plantigrade motion. They have three false molars above and four below, immediately antecedent to the carnivorous teeth, which are well characterised, and behind them two small tuberculous ones, the upper being more broad than long. Their superior carnivorous tooth has only one small tubercle on the inner side, and in fact, the whole dental system is nearly the same as that of the weasels. The tail is of a middling size, with a plait or fold beneath in place of a sac, and the port of the animal is very similar to that of the badger.

The most celebrated species is the Glutton of the north, the *Ursus gulo*, L. (The Common Glutton.) About the size of the Badger; usually of a fine deep marone colour, with a disk on the back of a darker brown; sometimes, however, the shades are lighter. It inhabits the coldest regions of the North, and is considered very sanguinary and ferocious, it hunts during the night, does not become torpid during the winter, and masters the largest animals by leaping upon them from the top of a tree. Its voracity has been ridiculously exaggerated by some authors. The *Wolverene* of North America (*Ursus luscus*, Lin.) does not appear to differ from it in any constant character—its colours, however, are generally lighter.

Hot climates produce some species which can only be placed near the Gluttons, as they differ from them merely in having one false molar less in each jaw, and in a long tail. Such are the animals, termed by the inhabitants of South America *Ferrets*, which, having the teeth of our Ferrets and Polecats, have in fact similar habits—they are distinguished from them, however, by their plantigrade motion.

Viverra vittata, L. (The Grison.) Black; top of the head and neck grey; a white band, reaching from the forehead to the shoulders.

Mustela Barbara. This and another species (The Taira) are found in all the warm parts of America; they smell strongly of musk. Their feet are somewhat palmated, and it appears they have been sometimes taken for Otters.

RATELUS, *F. Cuvier.*

The *Ratels* have a false molar in each jaw less than the Grison, and their upper tuberculous tooth is but slightly developed, so that in the teeth they approach the Cat, while their whole exterior is that of the Grison or Badger. The legs are short; feet plantigrade, and five toes to each; nails very strong, &c. &c.

One species only is known, the *Viverra mellivora*, Sparm. Size of the European Badger; grey above; black beneath, with a white line that separates the two colours; sometimes it is nearly all white above. It inhabits the Cape of Good Hope, and digs up the earth with its long claws, in search of the honey-combs of the wild bees. The

DIGITIGRADA

Form the second tribe of the Carnivora. The animals which compose it walk on the ends of their toes.



In the first subdivision there is only one tuberculous tooth behind the upper carnivorous; these animals, on account of the length of their body, and the shortness of their legs, which permit them to pass through the smallest openings, have been styled *vermiform*. They are not torpid during the winter. Linnæus placed them all in one genus, that of

Mustela, *Linnæus.*

Or the *Weasels*, which we will divide into four subgenera.

Putorius, *Cuvier.*

The *Polecats* are the most sanguinary of all; the lower carnivorous tooth has no inner tubercle, and the superior tuberculous one is more broad than long; there are only two false molars above and three below. These animals are externally recognised by their muzzle, which is shorter and thicker than that of the Weasel. They all diffuse a most horrible stench when provoked.

Mustela putorius, L. Buff. (The Common Polecat.) Brown; flanks yellowish; white spots on the head; the terror of poultry yards and warrens.

M. lutreola, Pall. (The Mink or Norek.) It frequents the banks of rivers, &c., in the north and east of Europe from the Arctic Ocean to the Black Sea, and lives on frogs and crabs. The feet are slightly palmated at the base of the toes, but the teeth and round tail approximate it nearer to the Polecat than the Otter. It is of a reddish brown; the circumference of the lips and the under part of the jaw white; it exhales a musky odour, and is much esteemed for its well known fur. It is the Mink of the United States.

Mustela, *Cuvier.*

The true *Weasels* differ from the Polecats in having an additional false molar above and below, and in the existence of a small internal tubercle on their inferior carnivorous tooth, two characters which somewhat diminish the cruelty of their nature.

M. martes, L. (The Common Marten.) Brown, a yellow spot under the throat. Inhabits the woods. Siberia produces the

M. zibellina, Pall. (The Sable.) Highly valued for its rich fur, brown, spotted with white about the head, and distinguished from the preceding ones by the extension of the hair to the under surface of the toes. It inhabits the coldest mountains, and the hunting to obtain it, in the midst of winter and tremendous snows, is a perilous and painful undertaking. It is to the pursuit of this animal that we owe the discovery of the eastern countries of Siberia.

North America also possesses several Martens indicated by naturalists and travellers, under the indefinite names of *Pekan*, *Vison*, *Mink*, &c.

One of them, the *White Vison* of the furriers, *Mus. leutreocephala*, Harl., has as hairy feet and almost as soft a fur as the Sable, but is of a light fawn colour, and almost white about the head.

That which we call the *Pekan* (*Must. Canadensis*, Gmelin), and which comes from Canada and the United States, is of a brownish colour, mixed with white on the head, neck, shoulders and top of the back; nose, crupper, tail and limbs blackish.

Mephitis, *Cuvier.*

The *Skunk*, like the Polecat, has two false molars above and three below, but the superior tuberculous one is very large, and as long as it is broad, and the inferior carnivorous has two tubercles on its internal side, circumstances which ally it to the Badger just as the Polecat approximates to the Grison and Glutton. Independently of this, the anterior nails of the Skunk, like those of the Badger, are long and fitted for digging; they are moreover semi-plantigrade, and the resemblance extends even to the distribution of their colours. The whole family are remarkable for their fœtid exhalations, but the Skunk is pre-eminently distinguished by its most horrible and suffocating stench.

Skunks are generally marked with white stripes on a black ground, but the number of stripes appear to vary in the same species. The most common species of North America is the

M. putorius. (The American Skunk.) Black, with stripes of white, larger or smaller, and more or less numerous; the tail is black, and the tip white*. The odour it produces resembles that of the Polecat, mingled with a strong smell of garlic—nothing is more nauseous.

We may make a sub-genus of the *Mydace*, F. Cuvier, whose teeth, feet, and colour are similar to the skunk, but whose truncated muzzle resembles the hog's snout. One species only is known, *M. meliceps*, F. Cuvier, which is black, with a strip along the back, and a white tail.

Lutra, *Storr.*

The *Otters* have three false molars in each jaw, a strong heel to the superior carnivorous, a tuberculous on the inner side of the inferior one, and a large tuberculous tooth above that is nearly as long as it is broad. The head is compressed, and the tongue demi-asperate. They are otherwise distinguished from all the preceding sub-genera by palmated feet, and a horizontally flattened tail, two characters which render them aquatic. Their food is fish.

L. vulgaris. (The Common Otter.) Brown above, whitish round the lips, on the cheeks and the whole inferior surface of the body. It is sometimes found spotted and whitish. From the rivers of Europe.

Several otters differ but little from the above. That of Carolina (*L. lataxina*, Fr. Cuvier) becomes a little larger, is sometimes more deeply coloured, and has a brownish tint beneath; very frequently, however, there is no difference even in shades of colour.

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* No two individuals of this species are found alike, being sometimes wholly white, or the reverse.—Ed.

Mustela lutra Braziliensis, Gmelin. (The American Otter.) Brown or fawn-coloured; throat white or yellowish; a little larger than the European Otter; the body is also longer, and the hair shorter. It is distinguished by the end of the nose, which is not naked as in most animals, but is covered with hair like the rest of the chanfrin. From the rivers of both Americas.

Mustela lutris, Linnæus. (The Sea Otter.) Size, double that of the European species; body much elongated; tail one-third the length of the body; the hind feet very short. There is sometimes white about the head. It has only four incisors below, but the molars are like those of the other otters. Its blackish velvet-looking fur is extremely valuable, to obtain which the English and Russians hunt the animal throughout the northern parts of the Pacific Ocean.

In the second subdivision of the Digitigrada there are two flat tuberculous teeth, behind the superior carnivorous tooth, which is itself furnished with a large heel. They are carnivorous, but do not exhibit a courage proportioned to their powers, and frequently feed on carrion.

Canis, *Linnæus.*



Dogs have three false molars above, four below and two tuberculous teeth behind each of the carnivori; the first of these upper tuberculous teeth is very large. Their superior carnivorous has only a small inner tubercle, but the posterior portion of the inferior is altogether tuberculous. The tongue is soft; the fore feet have five toes, and the hind ones four.

C. familiaris, Linnæus. (The Domestic Dog.) Distinguished by his recurved tail, otherwise varying infinitely, as to size, form, colour, and quality of the hair. He is the most complete, singular, and useful conquest ever made by man; the whole species has become his property; each individual is devoted to his particular master, assumes his manners, knows and defends his possessions, and remains his true and faithful friend till death—and all this neither from constraint nor want, but solely from the purest gratitude and the truest friendship. The swiftness, strength, and scent of the dog have rendered him man's powerful ally against all other animals, and were even, perhaps, necessary to the establishment of society. Of all animals, he is the only one which has followed man through every region of the globe.

Some naturalists think the dog is a wolf, and others that he is a domesticated jackal; and yet those dogs which have become wild again in desert islands resemble neither the one nor the other. The wild dogs, and those that belong to savages, such as the inhabitants of New Holland, have straight ears, which has occasioned a belief that the European races, which approach the most to the original type, are the *Shepherd's Dog*, and *Wolf Dog*: but the comparison of the crania indicates a closer affinity in the Mastiff and Danish Dog, subsequently to which come the *Hound*, the *Pointer*, and the *Terrier*, differing between themselves only in size and the proportions of the limbs. The *Grey-*

hound is longer and more lank; its frontal sinuses are smaller, and its scent weaker. The *Shepherd's Dog*, and the *Wolf Dog* resume the straight ears of the wild ones, but with a greater cerebral development, which continues to increase together with intelligence in the *Barbet* and the *Spaniel*. The *Bull Dog*, on the other hand, is remarkable for the shortness and strength of his jaws. The small pet-dogs, the *Pugs, Spaniels, Shocks*, &c. are the most degenerate productions, and exhibit the most striking marks of that power to which man subjects all nature.

The dog is born with his eyes closed; he opens them on the tenth or twelfth day; his teeth commence changing in the fourth month, and his full growth is attained at the expiration of the second year. The dog is old at fifteen years, and seldom lives beyond twenty. His vigilance, bark, and susceptibility of education are well known to every one.

C. lupus, Lin. (The Wolf.) A large species with a straight tail; legs fawn-coloured, with a black stripe on the fore-legs when adult; the most mischievous of all the Carnaria of Europe. It is found from Egypt to Lapland, and appears to have passed into America. Towards the north, in winter, its fur becomes white. It attacks all our animals, yet does not exhibit a courage proportioned to its strength. It often feeds on carrion. Its habits and physical development are closely related to those of the dog.

C. jubatus, Cuv.; *Agoura-Gouazou*, Azzara. (The Red Wolf.) A fine cinnamon-red: a short black mane along the spine. From the marshes of South America.

C. aureus, Lin. (The Chacal, or Jackal.) Less than the preceding; the muzzle more pointed; of a greyish brown; thighs and legs of a light fawn-colour; some red on the ear; the tail scarcely reaching further than the heel. It is a voracious animal, which hunts like the dog, and in its conformation and the facility with which it is tamed resembles the latter more closely than any other wild species. Jackals are found from the Indies and the environs of the Caspian Sea, as far as and in Guinea; it is not certain, however, that they are all of one species. Those of Senegal, for instance, (*C. anthus*, Fr. Cuv.) stand higher, appear to have a sharper muzzle, and the tail a little longer.

Foxes may be distinguished from the wolf and dog by a longer and more tufted tail, by a more pointed muzzle, by pupils which during the day form a vertical fissure, and by the upper incisors being less sloping. They diffuse a fetid odour, dig burrows, and attack none but the weaker animals. This sub-genus is more numerous than the preceding one.

C. vulpes, Lin. (The Common Fox.) More or less red; tip of the tail white; found from Sweden to Egypt. Those of the north have merely a more brilliant fur. This species was introduced into America by some Englishmen, and has been described by some authors as a different species.

The prairies of North America also produce a little Fox (*C. velox*, Harl. and Say), which lives in burrows.

C. cinereo-argenteus, Schreb. (The Tri-coloured Fox of America.) Ash-coloured above; white beneath; a cinnamon-red band along the flanks. From all the warm and temperate parts of the two Americas.

C. argentatus. (The Silver or Black Fox.) Black; tips of the hairs white, except on the ears, shoulders, and tail, where they are of a pure black. The end of the tail is all white. From North America. Its fur is most beautiful, and very costly.

The interior of Africa produces Foxes remarkable for the size of their ears, and the strength of the hairs of their mustachios; they are the MEGALOTIS of Illiger.

Finally, we may place after the Dogs, as a fourth subgenus, distinguished by the number of the toes, which is four to each foot, the

Hyæna venatica, Bursch. (The Wild Dog of the Cape.) It has the dental system of the dog, and not that of the hyena; a long and thin form; the fur mottled, with white and fawn-colour, grey and black; size of the wolf; large ears with black tips, &c. It is gregarious, and frequently approaches Cape Town, devastating its environs.

VIVERRA.



The *Civets* have three false molars above and four below, the anterior of which sometimes fall out; two tolerably large tuberculous teeth above, one only below, and two tubercles projecting forwards on the inner side of the inferior carnivora, the rest of that tooth being more or less tuberculous. The tongue is bristled with sharp and rough papillæ. Their claws are more or less raised as they walk, and near the buttock is a pouch more or less deep, where an unctuous and frequently an odorous matter oozes from peculiar glands. They are divided into four subgenera.

VIVERRA, *Cuvier.*

In the true *Civets* there is a deep pouch divided into two sacs, filled with an abundant pommade of a strong musty odour, secreted by glands which surround it. This substance is an article of commerce, and is used by the perfumers. It was more employed when musk and ambergris were unknown. The pupil of the eye remains round during the day, and their claws are only semi-retractile.

V. civetta. Lin. (The Civet.) Ash-coloured, irregularly barred and spotted with black; the tail less than the body, black towards the end, with four or five rings near its base; two black bands encircling the throat, and one surrounding the face; a mane along the whole length of the spine and tail that bristles up at the will of the animal. From the hottest parts of Africa.

V. Zibetha, Lin. (The Zibet.) Ash-coloured, spotted with black; black half rings on the whole tail, and black bands on the sides of the neck. From the East Indies.

GENETTA, *Cuvier.*

In the *Genets* the pouch is reduced to a slight depression formed by the projection of the glands, and has scarcely any visible excretion, although an

odour is diffused from it that is very perceptible. In the light the pupil forms a vertical fissure, and the nails are completely retractile, as in the cat.

V. genetta, Lin. (The Common Genet.) Grey spotted with brown or black, the muzzle blackish; white spots on the eyebrows, cheeks, and each side of the end of the nose; tail the length of the body, annulated with black and white, the black rings being from nine to eleven in number. Found from the south of France to the Cape of Good Hope; frequents the edges of brooks, near springs, &c. The skin forms an inportant article of trade.

PARADOXURUS, *Fr. Cuvier*,

Has the teeth and most of the characters of the Genets, with which it was a long time confounded; it is, however, more stout-limbed; the feet are semi-palmate, and the walk nearly plantigrade; but what particularly distinguishes it is the spiral inclination of the tail, which is not prehensile. Only one species is known, the

P. typus, Fr. Cuv. (The Pougouné of India.) A yellowish-brown, with some spots of a deeper brown than the rest; the feet, muzzle, and part of the tail blackish; eye-brows white, and a white spot under the eye. The other species are *V. linsang*, Hardwick; *V. fossa*, Buffon; *V. rasse*, Horsfield.

MANGUSTA, *Cuvier*—HERPESTES, *Illiger*.

The pouch is voluminous and simple. The hairs are annulated with light and obscure tints, which determine their general colour on the eye.

The Mangouste of Egypt, so celebrated among the ancients under the name of *Ichneumon*, is grey, with a long tail terminated with a black tuft; it is larger than our cat, and as slender as a marten. It chiefly hunts for the eggs of the crocodile, but also feeds on all sorts of small animals; brought up in houses, it hunts mice, reptiles, &c. By the Europeans at Cairo it is called *Pharaoh's Rat*; by the natives, *Nems*. The ancient tradition of its jumping down the throat of the crocodile to destroy it, is entirely fabulous. There are several other species mentioned, but it is difficult to establish a specific distinction.

RYZÆNA, *Illiger*.

The *Surikates* have a strong resemblance to the Mangoustes, even to the tints and transverse streaks of the hair; but are distinguished from them and from all the Carnivora of which we have hitherto spoken, by having only four toes to each foot. They also are higher on their legs, and they have not the small molar immediately behind the canine tooth.

One species only is known, a native of Africa (*Viv. tetradactyla*, Gm.), a little less than the Mangouste of India.

CROSSARCHUS, *Fred. Cuvier*,

Has the muzzle, teeth, pouch, and walk of the Surikates, and the toes of the Mangoustes.

One species only is known—*Crossarchus obscurus*, Fred. Cuv.—from Sierra Leone, of the size of the Surikate; greyish brown; cheeks a little paler, and a hairy tail.

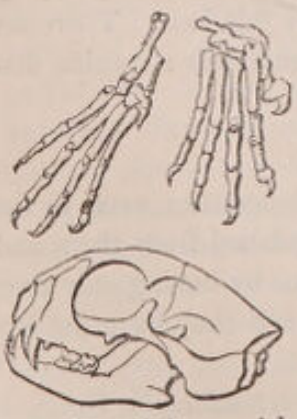
The last subdivision of the Digitigrada has no small teeth of any kind behind the large molar of the lower jaw. The animals contained in it are the most cruel and sanguinary of the class. They form two genera.

Hyæna, *Storr.*

The *Hyænas* have three false molars above and four below, all conical, blunt, and singularly large; their superior carnivorous tooth has a small tubercle within and in front, but the inferior has none, presenting only two stout trenchant points: with these powerful arms they are enabled to crush the bones of the largest prey. The tongue is rough, and each foot has four toes like that of the Surikate. So powerful are the muscles of the neck and jaw, that it is almost impossible to wrest any thing from between their teeth that they have once seized, and among the Arabs their name is the symbol of obstinacy. It sometimes happens that an anchylosis of the cervical vertebræ is the consequence of these violent efforts, and this has caused it to be said that they have only one single bone in the neck. They are nocturnal animals, inhabiting caves; are extremely voracious, and feed chiefly on dead bodies, which they seek for even in the grave. A thousand superstitious traditions are connected with them. Three species are known, one of which is the

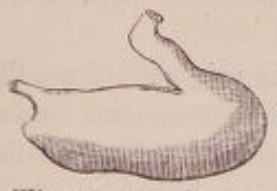
H. vulgaris, Buff. (The Striped Hyæna.) Grey; blackish or brown stripes crosswise; a mane along the whole of the nape of the neck, and black, that stands erect when the animal is angry. It is found from India to Abyssinia and Senegal. The brown and spotted Hyænas are the two others.

Felis, *Linnæus.*



Of all the Carnaria the *Cats* are the most completely and powerfully armed. Their short and round muzzle, short jaws, and particularly their retractile nails, which being raised perpendicularly, and hidden between the toes when at rest, by the action of an elastic ligament, lose neither point nor edge, render them most formidable animals, the larger species especially. They have two false molars above, and two below: their superior carnivorous tooth has three lobes, and a blunted heel on the inner side; the inferior, two pointed and trenchant lobes, without any heel: they have but a very small tuberculous tooth above, without any thing to correspond to it below. The species of this genus are very numerous, and various with regard to size and colour, though they are all similar with respect to form. We can only subdivide them by referring to the difference of size and the length of the hair, characters of but little importance. At the head of the genus we find





F. leo, Lin. (The Lion.) Distinguished by its uniform tawny colour, the tuft of hair at the end of the tail, and the flowing mane which clothes the head, neck, and shoulders of the male. Of all beasts of prey this is the strongest and most courageous. Formerly scattered through the three parts of the old world, it seems at present to be confined to Africa and some of the neighbouring parts of Asia. The head of the Lion is more square than that of the following species.

Tigers are a large, short-haired species, most commonly marked with vivid spots.

F. tigris, Buff. (The Royal Tiger.) As large as the lion, but the body is longer, and the head rounder; of a lively fawn colour above; a pure white below, irregularly crossed with black stripes; the most cruel of all quadrupeds, and the scourge of the East Indies. Such is his strength and the velocity of his movements, that during the march of armies he has been seen to seize a soldier, while on horseback, and bear him to the depths of the forest, without affording a possibility of rescue.

F. onça, Lin. (The Jaguar.) Nearly the size of the royal tiger, and almost as dangerous; a bright fawn colour above; the flank longitudinally marked with four rows of occillated spots, that is, with rings more or less complete, having a black point in the middle; white beneath, transversely striped with black. Sometimes individual specimens are found black, whose rings, of a deeper hue, are only perceptible in a particular light.

F. pardus, Lin.; the *Pardalis* of the ancients. (The Panther.) Fawn-coloured above; white beneath; with six or seven rows of black spots, resembling roses, that is, formed by the assemblage of five or six simple spots on on each flank; the tail is the length of the body, minus that of the head. This species is scattered throughout Africa, Southern Asia, and the Indian Archipelago.

F. leopardus, Lin. (The Leopard.) From Africa; similar to the Panther, but has ten rows of smaller spots.

F. discolor, Lin.; Buff. (The Couguar or Puma.) Red, with small spots of a slightly deeper red, which are not easily perceived. From both Americas, where it preys on sheep, deer, &c.

Among the inferior species, we should distinguish the Lynxes, which are remarkable for the pencils of hair which ornament their ears. Four or five different kinds of them are known in commerce. The most beautiful, which are as large as the Wolf (*F. cervaria*, Temm.), come from Asia by the way of Russia, and have a slightly reddish-grey fur, finely spotted with black.

Others from Canada and the north of Sweden (*F. borealis*, Temm.), have the fur very much tufted, extending even under the feet; of an ash-coloured grey, and with scarcely any spots. We find also in North America the

F. rufa, Güld. (The Bay Lynx.) A reddish fawn or greyish colour, mottled with brown; brown waves on the thighs; tail annulated with black or brown; rather smaller than the Lynx.

F. caracal, Lin. (The Caracal.) Of an almost uniform vinous red. From Persia, Turkey, &c. It is the true Lynx of the ancients.

The inferior species, which are deprived of the pencils on the ears, are more or less similar to our common cat; such is

F. pardalis, Lin.; Buff. (The Ocelot.) Rather lower on its legs than most of the others; grey, with large fawn-coloured spots bordered with black, forming oblique bands on the flank. From America.

F. catus, Lin. (The Domestic Cat.) This animal is originally from the forests of Europe. In its wild state, it is of a greyish brown, with darker transverse undulations; below pale; the insides of the thighs and of all the feet yellowish; three bands on the tail, its inferior third blackish. In a domestic state it varies, as is well known, in colours, in the length and fineness of the hair, but infinitely less so than the dog; it is also much less submissive and affectionate. The species more or less allied to the cat are very numerous in the two continents; but most of those given in catalogues are far from being authentic, or sufficiently distinguished from each other. The

AMPHIBIA



Will form the third and last of the small tribes into which we divide the Carnivora. Their feet are so short and so enveloped in the skin, that the only service they can render them on land is to enable them to crawl; but as the intervals of the fingers are occupied by membranes, they are excellent oars; and in fact these animals pass the greater portion of their time in the water, never landing, except for the purpose of basking in the sun, and suckling their young. Their elongated body; their very moveable spine, which is provided with muscles that strongly flex it; their narrow pelvis; their short hair, that adheres closely to the skin—all unite to render them good swimmers; and all the details of their anatomy confirm these first indicia.

We have as yet distinguished two genera only, Phoca and Trichechus.

Phoca, *Linnæus.*



Seals have six or four incisors above, four or two below, pointed canini and grinders to the number of twenty, twenty-two, or twenty-four, all trenchant or conical, and without any tuberculous part whatever; five toes to all the feet, the anterior ones regularly decreasing in length from the thumb to the little toe, while in the hinder feet the thumb and the little toe are the longest, and the intermediate ones the shortest. The fore feet are enveloped in the skin of the body as far as the tarsus, the hinder ones almost to the heel. Between the latter is a short tail. The head of a Seal bears a resemblance to that of a dog, whose intelligence and soft expressive look it also possesses. It is easily tamed, and soon becomes attached to its keeper, or those who feed it. The tongue is smooth and sloped at the end, the stomach simple, cæcum short, and the intestinal canal long, and tolerably regular

These animals live on fish; always eat in the water, and close their nostrils when they dive by a kind of valve. They remain a long time under water; there is a large venous *sinus* in the liver, which must assist them in diving, by rendering respiration less necessary to the motion of the blood. Their blood is very abundant and very black.

PHOCA, *properly so called, or without external ears.*

The true Phocæ have pointed incisors; all the toes enjoy a certain degree of motion, and are terminated by pointed nails planted on the edge of the membrane which unites them.

They are subdivided, from the number of their incisors. The CALOCEPHALA (Fr. Cuv.) have six above and four below; such is the

Phoca vitulina, Lin. (The Common Seal.) From three to five feet in length; of a yellowish grey, more or less shaded, and spotted with brown, according to its age; sometimes brownish, with small yellow spots. When very old it becomes whitish. Common on the coast of Europe in great herds. It is also found far to the north; we are even assured that it is this species which inhabits the Caspian Sea, and the great fresh water lakes of Russia and Siberia, but this assertion does not appear to be founded on an exact comparison. In fact, the European seas contain several Phocæ, which have long been confounded, some of which are perhaps mere varieties of the others.

STENORHINCUS, *Fred. Cuvier.*

Four incisors above, and four below, the molars deeply notched into three points.

One species only is known, and that is from the Austral seas—*Ph. leptonix*, Blain. Size of the barbata; greyish above, yellowish beneath; nails small.

PELAGUS, *Fred. Cuvier.*

Four incisors also, above and below; but their grinders are obtuse cones, with a slightly marked heel before and behind. There is one of them in the Mediterranean.

Ph. monachus, Gm. (The Monk.) From ten to twelve feet in length, of a blackish brown, with a white belly. It is particularly found among the Grecian and Adriatic Islands, and is, most probably, the species best known to the ancients.

STEMMATOPUS, *Fred. Cuvier.*

Four superior incisors, and two inferiors, grinders compressed, slightly trilobate, supported by thick roots. Such is the

Ph. cristata, Gm. (The Hooded Seal.) Seven or eight feet long; a piece of loose skin on the head, which can be inflated at the pleasure of the animal, and is drawn over the eyes when it is menaced, at which times the nostrils also are inflated like bladders. From the Arctic Ocean.

Finally, the MACRORHINUS (Fr. Cuv.) has the incisors of the preceding, obtuse conical molars, and the muzzle resembling a short moveable proboscis, or snout. The largest seal known is of this subgenus; the

Ph. leonina, Lin. (The Elephant Seal.) From twenty to twenty-five feet in length; brown; the muzzle of the male terminated by a wrinkled snout, which

becomes inflated when the animal is angry. It is common in the southern latitudes of the Pacific Ocean, at the Terra del Fuego, New Zealand, Chili, &c. It constitutes an important object of the fisheries, on account of the oil in which it abounds. The

OTARIES, *Péron—Seals with external ears—*

Are worthy of being formed into a separate genus; because, independently of the projecting external ears, the four superior middle incisors have a double cutting edge, a circumstance hitherto unknown in any animal; the external ones are simple and smaller, and the four inferior bifurcated. All the molars are simply conical, and the toes of the fore feet almost immoveable; the membrane of the hind feet is lengthened out into a slip beyond each toe; all the nails are flat and slender.

Ph. jubata, Gm.; *Sea-Lion* of Steller, Pernetty, &c. From fifteen to twenty feet, and more, in length; fawn-coloured; the neck of the male covered with hairs that are more frizzled and thickly set than those on the rest of the body. It might be said to be found in all the Pacific Ocean, were it not that those from the straits of Magellan seem to differ from such as are taken at the Aleutian islands.

TRICHECUS, *Linnæus* *.



The *Morse* resembles the Seal in its limbs, and the general form of the body; but differs widely from it in the teeth and head. There are no incisors nor canini in the lower jaw, which is compressed anteriorly to pass between two enormous canini or tusks, which issue from the upper one, and which project downward, being sometimes two feet long, and of a proportionable thickness. The enormous size of the alveoli, requisite for holding such tremendous canini, raises up the whole front of the upper jaw, giving it the shape of a huge inflated jowl, the nostrils looking upwards, and not terminating the muzzle. The molars are all short obliquely truncated cylinders; there are four of them on each side, above and below, but, at a particular age, two of the upper ones fall out. Between the canini are two incisors, similar to the molars, which most authors have not recognised as such, although they are implanted in the intermaxillary bone. Between these again, in the young animal are two more small pointed ones.

The stomach and intestines of the Morse are very small compared to those of the Seal. It appears that *fucus* constitutes part of its food, along with animal matters. One species only is as yet ascertained, the

Trich. rosmarus, Lin. (The Sea Cow.) It inhabits the Arctic Seas, surpasses the largest ox in size, attains the length of twenty feet, and is covered with a short yellowish hair. It is sought for on account of its oil and tusks; the ivory of which, although rough-grained, is employed in the arts. The skin makes excellent coach braces.

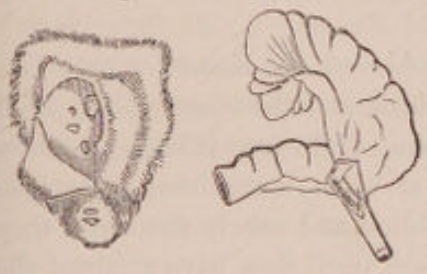
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* Trichechus, from τρίξ (hair), a name invented by Artedi for the Sea Cow.

ORDER IV.

MARSUPIALIA.

So many are the singularities in the economy of the Marsupialia or *pouched animals*, as they are termed, which we formerly placed at the end of the Carnaria as a fourth family of that great order, that it appears to us they should form a separate and distinct one, particularly as we observe in them a kind of representation of three very different orders.



The first of all their peculiarities is the premature production of their young, whose state of development at birth is extremely small. Incapable of motion, and hardly exhibiting the germs of limbs and other external organs, these diminutive beings attach themselves to the mammæ of the mother, and remain fixed there until they have acquired a degree of development similar to that in which other animals are born. The skin of the abdomen is almost always so arranged about the mammæ as to form a pouch in which these imperfect little animals are preserved as in a second uterus; and to which, long after they can walk, they always fly for shelter at the approach of danger Two particular bones attached to the pubis, and interposed between the muscles of the abdomen, support the pouch. These bones are also found in the male, and even in those species in which the fold that forms the pouch is scarcely visible.

Another peculiarity of the Marsupialia is, that notwithstanding a general resemblance of the species to each other, so striking that for a long time they were considered as one genus, they differ so much in the teeth, the organs of digestion, and the feet, that if we rigorously adhered to these characters, we should be compelled to separate them into several orders. They carry us by insensible gradations from the Carnaria to the Rodentia, and there are even some animals which have the pelvis furnished with similar bones; but which, from the want of incisors or of all kinds of teeth, have been approximated to the Edentata, where, in fact, we shall leave them, under the name of Monotremata.

The first subdivision of the Marsupialia is marked by long canini, and small incisors in both jaws, back molars bristled with points, and all the characters in general of the insectivorous Carnaria; the animals that compose it are also perfectly similar to the latter in their regimen.

DIDELPHIS, *Linnæus.*

The *Opossums*, which of all the Marsupialia have been the longest known, form a genus peculiar to America. They have ten incisors above, the middle ones

being rather the longest, and eight below; three anterior compressed grinders, and four posterior bristled grinders, the superior ones triangular, and the inferior ones oblong, which, with the four canini, make in all fifty teeth, the greatest number hitherto observed in Quadrupeds. Their tongue is papillated, and their tail prehensile, and partly naked. Their hinder thumb is long, and very opposable to the other four toes, from which circumstance these animals are sometimes styled *Pedimana;* they have no nail. Their extremely wide mouth and great naked ears give them a very peculiar physiognomy. They are fetid and nocturnal animals, whose gait is slow; they remain on trees, and there pursue birds, insects, &c., though not despising fruit.

The females of certain species have a deep pouch, in which are the mammæ, and in which they can enclose their young.

Did. virginiana, Penn. (The Opossum.) Almost the size of a cat; fur, a mixture of black and white; ears, one side black, and the other white; head nearly all white. Inhabits all America; steals at night into villages; attacks fowls, eats their eggs, &c. The young ones at birth, sometimes sixteen in number, weigh only a grain each. Although blind and nearly shapeless, they find the mammæ by instinct, and adhere to them until they have attained the size of a mouse, which happens about the fiftieth day, at which epoch they open their eyes. They continue to return to the pouch till they are as large as rats.

Other species possess no pouch, having a mere vestige of it in a fold of the skin on each side of the abdomen. They usually carry their young on their backs, the tails of the latter being entwined around that of the mother.

Did. nudicauda, Geoff. (The Bare-tailed Opossum.) Fawn-coloured; tail very long, and naked even at its base; two whitish spots over each eye, one beneath.

Finally, there is one known with palmated feet, which must be aquatic; it is not ascertained whether it has a pouch or not—it is the

CHIRONECTES, *Illiger* *.

Did. palamta, Geoff. Brown above, with three transverse grey bands, interrupted in the middle, and white below; larger than a Norway rat.

All the other Marsupialia inhabit eastern countries, New Holland particularly, a land whose animal population seems chiefly to belong to this family.

THYLACINUS, *Temminck* †.

The Thylacini are the largest of this first division. They are distinguished from the opossums by the hind feet having no thumb; a hairy, non-prehensile tail, and two incisors less in each jaw; their molars are of the same number. They, consequently, have forty-six teeth; but the external edge of

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* *Chironectes*, i. e. swimming with hands. † Thylacinus, from θυλακος, purse.

the three large ones is projecting and trenchant, almost like the carnivorous tooth of a dog; their ears are hairy, and of a medium size. One species only is known, the

Did. cynocephala, Harris. Size that of a wolf, but stands lower; grey; transverse black stripes on the crupper. It is very carnivorous, and pursues all small quadrupeds. From Van Diemen's Land.

PHASCOGALE, *Temminck.*

The same number of teeth as the Thylacini, but the middle incisors are longer than the others, and the back molars more bristled, circumstances which approximate them more closely to the Sarigues. They are also allied to them by their small size; their tail, however, is not prehensile; their hind thumb, though very short, is still very apparent.

Did. penicillata, Shaw. Ash-coloured; tail furnished with long black hairs; size that of the Norway rat; lives on the trees in New Holland, and pursues insects.

DASYURUS, *Geoffroy.*



Two incisors and four grinders in each jaw less than the opossums, so that they have only forty-two teeth; their tail, every where covered with long hairs, is not prehensile. The thumb of the hind foot is reduced to a tubercle, or has even totally disappeared They are from New Holland, where they feed on insects and dead bodies; they penetrate into houses, where their voracity is very inconvenient. Their mouth is not so wide, their muzzle not so pointed, as those of the opossums; their hairy ears are also shorter. They do not climb trees.

Did. ursina, Harr. (The Ursine Opossum.) Long rough black hairs, with some irregularly placed white spots; the tail half as long as the body, almost naked underneath. Inhabits the north of Van Diemen's Land, and is nearly the size of the badger.

PERAMELES, *Geoffroy*†.—THYLACIS, *Illiger.*

The thumb of the hind foot short, like the first Dasyuri, and the two following toes united by the membrane as far as the nails; the thumb and the little toe of their fore feet are simple tubercles, so that there seem to be but three toes. They have ten incisors above, the external ones separate and pointed, and only six below; but their molars are the same as in the opossums, so that they have forty-eight teeth. Their tail is hairy, and not prehensile. The great claws of their fore feet announce their habit of digging in the earth; and the tolerable length of their hind ones, a swiftness of gait.

P. nasutus, Geoff. The muzzle much elongated; ears pointed; fur a greyish brown. At the first glance it resembles a tenrec.

The species belonging to the second subdivision of the Marsupialia have two broad and long incisors in the lower jaw with pointed and trenchant edges

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* *Dasyurus*, hairy tail. † *Pera*, purse: *Meles*, badger.

sloping forwards, and six corresponding ones in the upper jaw. Their superior canini are also long and pointed, but all their inferior ones consist of teeth so small that they are frequently hidden by the gum ; they are sometimes altogether wanting in the lower jaw of the last subgenus.

Their regimen is chiefly frugivorous. The thumb is very large in all of them, and so widely separated from the toes that it seems to slant backwards almost like that of birds. It has no nail, and the two following toes are united by the skin as far as the last phalanx. It is from this circumstance that these animals have received the name of Phalangers.

Phalangista.

Phalangista, *Cuvier.*—Balantia, *Illiger**.



The *true Phalagers* have not the skin of the flank extended ; four back molars in each jaw, with four points in two rows ; in front a large one, conical and compressed ; and between it and the superior canine two small and pointed ones, to which correspond the three very small lower ones, of which we have just spoken. Their tail is always prehensile.

The tail in some of them is in a great measure scaly. They live on trees in the Moluccas, where they feed on insects and fruit. At the sight of a man they suspend themselves by their tail; and if he gaze at them steadily for some time, they fall through lassitude. They diffuse a very unpleasant odour, notwithstanding which their flesh is eaten. There are several of them known, of various sizes and colours, all of which are embraced under the *Didelphis orientalis* of Linnæus.

Ph. ursina, T. (The Ursine Phalanger.) Nearly the size of the civet, fur close, and of a blackish brown ; the young ones a fawn-coloured brown. From the woods of the island of Macassar. In others, which have hitherto been found in New Holland only, the tail is hairy to the tip.

Ph. vulpina. (The Fox-like Phalanger.) Size of a stout cat; greyish-brown; paler beneath; tail nearly all black.

To these we may add the Hollow-fronted Phalanger (*Ph. Cavifrons*) represented in the engraving, the male of which is white; the female fawn-coloured, with a brown stripe along the back.

Petaurus, *Shaw*—Phalangista, *Illiger.*

The *Flying Phalangers* have the skin of the flanks more or less extended, between the legs, like the Flying Squirrels among the Rodentia, which enables them to sustain themselves momentarily in the air, and make greater leaps. They also are only found in New Holland.

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* Balantia, from *βαλαντιον*, purse or pouch.

Some of the species have inferior canini, but they are very small. Their superior canini and their three first molars, above and below, are very pointed; each of their back molars has four points.

Ph. pygmæa. (The Flying Dwarf Phalanger.) Of the colour and nearly the size of a mouse; the hairs of the tail regularly arranged on its two sides, like the web of a quill.

Other species have no inferior canini, while the superior ones are very small. Their four black molars present four points, but they are slightly curved into a crescent, which is very nearly the form of those of the Ruminantia. In front there are two above, and one below, less complicated. By this structure they are rendered still more frugivorous than all the preceding species.

Ph. petaurus. (The Great Flying Phalanger.) Resembles the Taguan and the Galeopithecus in size; its fur is soft and close; its tail long and flattened; brownish-black above, white beneath. They are of various shades of brown; some are variegated, and others perfectly white.

Our third subdivision has the incisors and superior canini of the second. The two toes of the hind feet are also similarly united; but the posterior thumbs and inferior canini are wanting. It contains but a single genus.

Hypsiprymnus, *Illiger**.

The *Potoroos* are the last animals of this family which retain any trait of the general characters of the Carnaria. Their teeth are nearly the same as those of the phalangers, and they still have pointed canini above. What particularly distinguishes these animals is their hind legs, which are much larger in proportion than the fore ones that have no thumbs, and the two first toes united as far as the nail; so that, at a first glance, it seems as though there were but three toes, the middle one having two nails. They frequently walk upon two feet, at which times they employ their long and strong tail to support themselves. They have then the form and habits of the kanguroos, from which they only differ in their superior canine tooth. They are frugivorous.

Hyps. minor. (The Kanguroo Rat.) Size of a small rabbit; of a mouse-grey. From New Holland, where it is called *Potoroo.* It is the only species known.

The fourth subdivision only differs from the third in the absence of all canini whatsoever; it is the

Macropus, *Shaw*—Halmaturus, *Illiger*†.

The *Kanguroos* have all the characters we have assigned to the preceding genus, except that the superior canine is wanting, and that their middle incisors do not project beyond the others. The inequality of their legs is still greater, so that on all-fours they can only walk slowly and with difficulty; they make

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* Ὑψιπρυμνος; i. e. raised behind.

† *Halmaturus*, tail fit for leaping.

vigorous leaps, however, with their hind feet, the great middle nail of which (almost in the shape of a hoof) also serves them for purposes of defence; for, by supporting themselves on one foot and their enormous tail, they can inflict a severe blow with that which is at liberty. They are very gentle herbivorous animals, their grinders presenting mere transverse ridges.

M. major, Shaw. (The Gigantic Kanguroo.) Sometimes six feet in height. It is the largest of the New Holland animals; was discovered by Cook in 1779, and is now bred in Europe. Its flesh is said to resemble venison. The young ones, which at birth are only an inch long, remain in the maternal pouch even when they are old enough to graze, which they effect by stretching out their necks from their domicile, while the mother herself is feeding. These animals live in troops, conducted by the old males. They make enormous leaps. It appears that we have hitherto confounded under this name several species of New Holland and its neighbouring countries, whose fur, more or less grey, only varies by a trifling difference of shade.

Koala, *Cuvier*.—Liscurus, *Gold*.





l The fifth subdivision has two long incisors in the ower jaw, but no canini; in the upper, two long incisors in front, a few small ones on the sides, and two small canines. It comprehends but one genus.

The *Koalæ* have a short, stout body, short legs, and no tail. The toes of their fore feet, five in number, when about to seize any object, separate into two groups; the thumb and index on one side, and the remaining three on the other. The thumb is wanting on the hind foot; the two first toes of which are united like those of the phalangers and the kanguroos. One species only is known, which is represented above—the

K. cinerea. (The Koala.) Ash-coloured; passes one part of its life in trees, and the other in burrows which it excavates at their foot. The mother carries her young one for a long time on her back.

Finally, our sixth division of the Marsupialia, or the

Phascolomys, *Geoffroy**,

Consists of animals which are true Rodentia in the teeth and intestines, their only relation to the Carnaria consisting in the articulation of their lower jaw; and in a rigorously exact system it would be necessary to class them with the Rodentia. We should even have placed them there, had we not been led to them by a regular uninterrupted series from the Opossums to the Phalangers, from the latter to the Kanguroos, and from the Kanguroos to the Phascolomys.

They are sluggish animals, with large flat heads, and bodies that look as if

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* *Phascolomys*, a pouched rat; from φασκωλον and μυς.

they had been crushed. They are without a tail; have five nails on each of the fore feet, and four, with a small tubercle, in place of a thumb, on each of the hind ones, all very long and fit for digging. Their gait is excessively slow. They have two long incisors in each jaw, almost similar to those of the Rodentia; and each of their grinders has two transverse ridges.

They feed on grass. One species only is known, the

Phas. ursinus. (The Wombat.) Size of a badger; fur abundant, of a more or less yellowish brown. It is found in King's Island, to the south of New Holland, where it lives in its burrow. Its flesh is excellent.

ORDER V.

RODENTIA.

We have just seen, in the Phalangers, canini so very small that we cannot consider them as such. The nutriment of these animals, accordingly, is chiefly derived from the vegetable kingdom. Their intestines are long; and the Kanguroos, which have no canini whatever, subsist upon vegetables only. The Phascolomys might stand first in that series of animals of which we are about to speak, and which have a system of mastication still less complete.

Two large incisors in each jaw, separated from the molars by an empty space, cannot seize living prey nor tear flesh; they cannot even cut the food, but they serve to file, and by continued labour to reduce, it into separate particles—in a word, to *gnaw* it; hence the term *Rodentia* or *Gnawers*, which is applied to animals of this order. It is thus that they successfully attack the hardest substances, frequently feeding on wood and the bark of trees. The more easily to accomplish this object, the incisors have no thick enamel, except in front; so that their posterior edges wearing away faster than the anterior, they are always naturally sloped. Their prismatic form causes them to grow from the root as fast as they wear away at the edge; and this tendency to increase in length is so powerful, that if one of them be lost or broken, its antagonist in the other jaw having nothing to oppose or comminute, becomes developed to a most monstrous extent. The lower jaw is articulated by a longitudinal condyle, in such a way as to allow of no horizontal motion, except from back to front, and *vice versa*, as is requisite for the action of gnawing. The molars also have flat crowns, whose enamelled eminences are always transverse, so as to be in opposition to the horizontal motion of the jaw, and to increase the power of trituration.

The genera in which these eminences are simple lines, and the crown is very flat, are more exclusively frugivorous; those in which the eminences of the teeth are divided into blunt tubercles are omnivorous; while the small number of such as have no points more readily attack other animals, and approximate somewhat to the Carnaria.

The form of the body in the Rodentia is generally such, that the hinder

parts of it exceed those of the front; so that they rather leap than walk. In some of them this disproportion is even as excessive as it is in the kanguroos.

In the whole of this class, the brain is almost smooth and without furrows; the orbits are not separated from the temporal fossæ, which have but little depth, and the eyes are altogether lateral. The trigomatic arches, which are thin and curved below, announce the weakness of the claws; the fore arms have nearly lost the power of rotation, and their two bones are often united.

The inferiority of these animals is visible in most of the details of their organisation. Those genera, however, which possess stronger clavicles, have a certain degree of dexterity, and use their fore feet to convey their food to the mouth.

Some of them even climb with facility. The

SCIURUS, *Linnæus.*



Squirrels are distinguished by their strongly compressed inferior incisors, and by their long tail furnished with hairs. They have four toes before, and five behind. The thumb of the fore foot is sometimes marked by a tubercle. They have in all four grinders, variously tuberculated, and a very small additional one above in front, that very soon falls. The head is large, and the eyes projecting and lively. They are light and active animals, living on trees, and feeding on fruits.

SCIURUS, *Cuvier.*

In the Squirrel, properly so called, the hairs of the tail are arranged on the sides, so as to resemble a feather. There are a great many species in the two continents.

Sc. vulgaris, Buff. (The Common Squirrel.) The back of a lively red; belly white; ears terminated by a tuft of hair. Those of the north, in winter, become of a beautiful blueish ash colour, producing the fur called *minever* when taken only from the back, and *vair* (by the French) when it consists of the whole skin.

The American species have no pencils to their ears.

The CAT SQUIRREL (*Sc. cinereus,* Lin.) of America is cinereous above, white beneath; tail less distichous than that of the other species with which it has been confounded; there are but four teeth in the upper jaw on each side. The GREY SQUIRREL, (*Sc. Carolinensis,* Lin.)—Above mixed white, blackish, and rusty; beneath, white; cheeks rusty; tail as long as the body, edged with white; upper jaw five teeth on each side; this was described in the French edition as the *S. cinereus.*

It is probable that we shall have to separate from the Squirrels certain species which have cheek pouches like the Hamsters, and pass their lives in subterraneous holes; the *Tamia* of Illiger. For instance, the

Sc. striatus, Lin. (The Ground Squirrel.) Which is found throughout all the north of Asia and America, particularly in the pine forests. The tail is

more scantily supplied with hairs than that of the European Squirrel; the ears are smooth, and the skin brown, with five black stripes and two white ones.

We ought also, most probably, to distinguish the *Guerlinguets*, a species with a long, and almost round tail. They are found in both continents.

The following have been separated already.

Pteromys*,

Or the *Flying Squirrels*, to which the skin of the flank, extending between the fore and hind legs, imparts the faculty of supporting themselves for a moment in the air, and of making very great leaps. They have long bony appendages to their feet, which support a part of this lateral membrane.

There is a species found in Poland, Russia, and Siberia. (*Sc. Volans*, Lin.) The Flying Squirrel, about the size of a rat, grey ash-coloured above, white underneath. It lives solitarily in the forests. Another species,

Sc. voluccella, Lin. (The American Flying Squirrel.) Is reddish-grey above; white beneath; size less than that of the preceding; tail three-fourths as long as the body. It lives in troops in the prairies of North America. *S. petaurista*, Lin. (the Taguau) is found in the Indian Archipelago; it is nearly the size of a cat; the male has a fine lively marone above, and red underneath; the female is brown above, and whitish underneath.

M. Geoffroy has very properly separated from this genus the

Cheiromys†,

Or the *Aye-Ayes*, whose inferior incisors, much more compressed, and, above all, more extended from front to back, resemble ploughshares. Each foot has five toes, of which four of the anterior are excessively elongated, the medius being more slender than the others; in the hind feet the thumb is opposable to the other toes; so that they are in this respect among the Rodentia what the opossums are among the Carnaria. The structure of their head is otherwise very different from that of the other Rodentia, and is related to the Quadrumana in more points than one.

There is only one species of the Aye-Aye known. It was discovered at Madagascar by Sonnerat. It is the *Cheir. madagascariensis*. (The Aye-Aye.) Size of a hare, of a brown colour, mixed with yellow; tail long and thick, with stout black bristles; ears large and naked. It is a nocturnal animal, to which motion seems painful; it burrows under ground, and uses its slender toe to convey food to its mouth.

Linnæus and Pallas united in one single group, under the name of Mus, all the Rodentia furnished with clavicles which they could not distinguish by some very sensible external character, such as the tail of the squirrel or that of the beaver, from which resulted the utter impossibility of assigning to them

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* *Pteromys*, Winged Rat. † *Cheiromys*, a Rat with hands.

any common character; the greater number had merely pointed lower incisors, but even this was subject to exceptions.

Gmelin has already separated from them the Marmots, Dormice, and the Jerboas; but we carry their subdivisions much further, from considerations founded on the form of their grinders.

Arctomys, *Gmelin.**

The *Marmots*, it is true, have the inferior incisors pointed like those of the greater number of animals comprehended in the great genus Mus; but their grinders, like those of the squirrel, amount to five on each side above and four below, all bristled with points; accordingly, some species are inclined to eat flesh and feed upon insects, as well as grass. There are four toes and a tubercle in place of a thumb to the fore feet, and five toes to the hind ones. In other respects these animals are nearly the direct reverse of the squirrels, being heavy, having short legs, a middle sized or short hairy tail, and a large flat head, passing the winter in a state of torpor, and shut up in deep holes, the entrance of which they close with a heap of grass. They live in societies, and are easily tamed. Two species are known on the eastern continent. One is



Arct. alpinus. (The Alpine Marmot.) Large as a hare; tail short; fur yellowish grey, with ash-coloured tints about the head. It lives in high mountains, immediately below the region of perpetual snow. The Bobac (*A. bobac; M. bobac*, Lin.) is about the same size, of a yellowish grey, tinted with red about the head; it inhabits the low mountains and hills of Poland and Kamschatka, and will dig its burrow in the hardest soil.

America also produces several species. *Arct. monax*, Buff. (The Maryland Marmot.) Grey; tail blackish, as well as the top of the head.

Arct. empetra, Pall. Less than the preceding; grey; red beneath.

Spermophilus, *Fred. Cuvier.*

We apply this name to those *Marmots that have cheek pouches.* The superior lightness of their structure has caused them tobe called *Ground Squirrels.* Eastern Europe produces one species:

M. citillus. (The Souslik or Zizel.) A pretty little animal, of a greyish brown, watered or mottled with white, the spots very small, which is found from Bohemia to Siberia. It has a peculiar fondness for flesh, and does not spare even its own species.

North America has several species of them, one of which is remarkable by the thirteen fawn-coloured stripes which extend along the back on a blackish ground. It is the *Thirteen-striped Souslik, Arct.;* 13-*lineatus*, Harl.; or *Sciurus* 13-*lineatus*, Mitchell; or *Arct. Hoodii*, Sabine.

There is one of the Rodentia which it appears we must approximate to the

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* *Arctomys*, Bear-Rat.

Marmots, that is remarkable for living in large troops in immense burrows, which have even been styled villages. It is called the *Prairie Dog* or *Barking Squirrel*, the latter appellation arising from its voice, which resembles the bark of a small dog. It is the *Arct. ludovicianus* of Say—Jour. to the Rocky Mountains, I. 451.

Myoxus, *Gmelin**.

The *Dormice* have pointed lower incisors, and four grinders, the crown of each of which is divided by enamelled lines.

They are pretty little animals, with soft fur, a hairy and even tufted tail, and a lively eye, which live on trees like squirrels, and feed on fruit. They become torpid in winter like the marmots, and pass through it in the most profound lethargy.

M. glis, Lin. (The Fat Dormouse.) Size of a rat; ashy grey-brown above, whitish underneath; of a deeper brown around the eyes; tail very hairy the whole of its length, and disposed somewhat like that of a squirrel, and frequently a little forked at the extremity. It inhabits the south of Europe, and nestles in the hollows of trees and fissures of rocks. It sometimes attacks small birds. This is probably the rat fattened by the ancients, among whom it was considered a delicacy of the very highest description. There are two other well-known species. The Garden Dormouse (*M. nitella*), common in the gardens of Europe, where they shelter themselves in holes about the walls, and domuch injury to trees. The Common Dormouse (*M. avellanarius*, Lin.), constructs its nest of grass in the hollows of trees, where it remains during the winter.

We should place near the Dormice, the

Echimys, *Geoffroy*†.

Four grinders also, but formed in a peculiar way; the upper ones consisting of two blades, bent into the shape of a V, and the under ones of one blade only that is bent, and of another that is simple. The fur of several species is harsh and intermixed with flattened spines or prickles, like sword blades. From America. One of them is

Ech. chrysuros, Schreb. (The Golden-tailed Echimys.) More than twice the size of the brown rat; it is a beautiful animal, of a chestnut brown colour; white belly; an elongated crest of hairs, and a white longitudinal band on the head; the tail is long and black; the posterior half yellow. From Guiana.

Others, again, have merely the ordinary kind of hair, more or less rough. The most remarkable is the

Ech. dactylicus, Geoff. (The Long-toed Echimys.) Which is still larger than the Chrysuros, and has the two middle toes of the fore feet double the length of the lateral ones. Its scaly tail is longer than the body; its fur is a yellowish grey, and the hairs on its nose form a crest directed in front.

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* *Myoxus*, Rat with a pointed nose. † *Echimys*, or Spiny Rat.—*Ed.*

HYDROMYS, *Geoffroy.*

The *Hydromys* have many external points of relation to the Echimys, but they are distinguished from all other rats by their hind feet, two-thirds of which are palmated; their two molars have also a peculiar character in the crown, which is divided into obliquely quadrangular lobes, whose summits are hollowed out like the bowl of a spoon. They are aquatic.

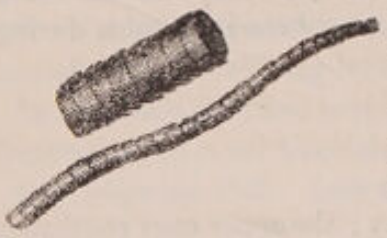
CAPROMYS, *Desmarest.*

The *Houtias* have four molars every where with flat crowns, the enamel of which is folded inwards so that it forms three angles on the external edge, and one only on the internal edge of the upper teeth, and the inverse in the lower ones. The tail is round and scantily pilose; they have, like the rats, five toes to the hind feet, and four with the rudiment of a thumb to the fore feet; their form is that of a rat; as large as a rabbit or hare. Two species are known: one is the *Cap. fournieri*, Desmar. The other,

Cap. prehensilis, Pœssig. Brown, with a whitish throat; tail red, as long as the body, and partly naked at the end. Both species inhabit the island of Cuba, and, together with the *Agoutis*, at the time of the discovery constituted the principal game of the Indians.

MUS, *Cuvier.*

The *true Rats* have three molars every where, of which the anterior is the largest; its crown is divided into blunt tubercles, which, by being worn, give it the shape of a disk, sloped in various directions; the tail is long and scaly. These animals are very injurious from their fecundity, and the voracity with which they devour every thing that comes within their reach. There are three species which have become quite common in our houses, viz.



M. musculus, Lin. (The Common Mouse.) Universally known.

M. rattus, Lin. (The Black Rat.) Of which no mention is made by the ancients, and which appears to have entered Europe in the tenth century. It is more than double the size of the mouse in each of its dimensions. The fur is blackish. Several individuals have been occasionally found connected by the interlacing of their tails; constituting what the Germans style the *King of Rats.*

M. decumanus, Pall. (The Norway or Brown Rat.) Which did not pass into Europe till the eighteenth century, and is now more common in large cities than the Black Rat itself. It is larger than the latter by one-fourth, and differs from it also by its reddish-brown hair.*

* It appears to belong to Persia, where it lives in burrows. It was not till 1727, that, after an earthquake, it arrived at Astracan, by swimming across the Volga.

These two large species appear to have originated in the East, and have been transported in ships, together with the mouse, to all parts of the globe.

GERBILLUS, *Desmarest.*

The *Gerbils* have molars that differ very little from those of rats, merely becoming sooner worn, so as to form transverse elevations. Their superior incisors are furrowed with a groove; their hind feet are somewhat longer in proportion than those of rats in general, and their thumb and little toe slightly separated. Their tail is long and hairy. The sandy and warm parts of the eastern continent produce several species.

G. Indicus. (The India Gerbil.) Size of the fat dormouse; fawn-coloured above, whitish beneath; tail longer than the body, and blackish at the end. The

MERIONES, *Fred. Cuvier,*

Which we separate from the other Gerbils, have the hind feet still longer; the tail nearly naked, and a very small tooth before the superior molars; characters which approximate them to the Jerboas. Their upper incisors are grooved like those of the Gerbils, and their toes also are similar. There is a small species in North America, the

Mus. Canadensis, Penn. (The Jumping Mouse.) Size of a mouse; fawn-coloured grey; tail longer than the body. In summer a very active animal, which in cold weather shuts itself up in its burrow, and passes the winter in a state of lethargy.

CRICETUS, *Cuvier,*

The *Hamsters* have nearly the same kind of teeth as rats, but their tail is short and hairy, and the two sides of their mouth are hollowed into sacs or cheek pouches, in which they transport the grain they collect to their subterraneous abodes.

C. vulgaris. (The Common Hamster.) Larger than the rat; of a reddish-grey above, black on the flanks and underneath, with three whitish spots on each side. A spot under the throat, and another under the breast white; some individuals are all black. This animal, so agreeably varied in colour, is one of the most noxious that exist, gathering large quantities of grain, with which it fills its burrow that is sometimes seven feet deep. It is common in all the sandy regions, that extend from the north of Germany to Siberia.

This last country produces several small species of Hamsters described by Pallas.

ARVICOLA, *Lacepede.*

The *Arvicolæ,* like the rats, have three grinders every where, but without roots, each one being formed of triangular prisms, placed on two alternate lines. They may be subdivided into several groups, viz.

FIBER, *Cuvier.*

The *Ondatras,* or *Musk Rats,* having semi-palmated hind feet, a long scaly and compressed tail, of which one species only is well known:

F. vulgaris. (The Canadian Musk Rat, or Ondatra.) As large as a rabbit

of a reddish-grey. In winter they construct, on the ice, a hut of earth, in which several of them reside together, passing through a hole in the bottom, for the roots of the *acorus*, on which they feed. They neither dive nor swim well. It is this habit of building which has induced some authors to refer the Ondatra to the genus*Castor*: The second subdivision is that of

ARVICOLA, *Cuvier*.—HYPUDÆUS, *Illiger*.

Our *common Field Rats*, which have a hairy tail, about the length of the body, and simple or not palmated feet.

A. arvalis. (The Campagnol.) Size of a mouse; of a reddish ash-colour; tail not so long as the body. It inhabits holes which it excavates in the earth, where it collects grain for the winter. The multiplication of this animal is sometimes so excessive as to cause much injury.

GEORYCHUS, *Illiger*,

Or the *Lemmings*, Cuv., have very short ears and tail, and the toes of the fore feet peculiarly well formed for digging.

G. lemmus. (The Lemming.) A northern species, as large as a rat, with black and yellow fur, very celebrated for its occasional migrations in innumerable bodies. At these periods they are said to march in a straight line, regardless of rivers or mountains; and while no obstacle can impede their progress, they devastate the country through which they pass. Their usual residence appears to be the shores of the Arctic Ocean.

G. Hudsonius; *Mus. Hudsonius*, Gm., Schreb. (The Lemming of Hudson's Bay.) A light pearly ash-colour; without tail or external ears; the two middle toes of the fore foot of the male seem to have double claws, which is owing to the skin at the end of the toe being callous and projecting from under the nail, a disposition of the part hitherto unknown, except in this animal. It is the size of a rat, and lives under ground, in North America.

OTOMYS, *Fred. Cuvier*.

The *Otomys* are nearly allied to the Field Rats, and have also three grinders, but they are composed of slightly articulated laminæ arranged in file. Their incisors are grooved with a longitudinal furrow, and the tail is hairy, as well as the ears, which are large.

O. capensis, Fred. Cuv. (The Cape Otomys.) Size of a rat; fur marked with black and fawn-coloured rings; tail a third shorter than the body.

DIPUS, *Gmelin*.

The *Jerboas* have nearly the same kind of teeth as the true rats, except that there is sometimes a very small one immediately before the upper molars. The tail is long and tufted at the end; the head large; the eyes large and prominent; but their principal character consists in their posterior extremities, which, in comparison with the anterior, are of a most immoderate length, and above all, in the metatarsus of the three middle toes, which is formed of one



single bone, resembling what is called the tarsus in birds. It is from this disproportion of the limbs that they were named by the ancients biped rats, and in fact they seldom move otherwise than by great leaps on their hind feet. There are five toes to each of the fore feet; and in certain species, besides the three great toes to the hind feet, there are small lateral ones. They live in burrows, and become torpid during the winter.

D. sagitta. The jerboa has only three toes, and is the size of a rat; a light fawn colour above; white beneath; tuft of the tail black, the tip white. Is found from Barbary to the north of the Caspian Sea.

Helamys, *F. Cuvier.*—Pedetes, *Illiger*.*

The *Jumping Hares*, like the Jerboas, have a large head and great eyes, a long tail, and the anterior part of the body extremely small, in comparison to the posterior, although the disproportion is much less than in the true Jerboas. The peculiar characters of the Helamys are four grinders every where, each one composed of two laminæ; five toes to the fore-feet, armed with long and pointed nails, and four to their great hind ones, all separate, even to the bones of the metatarsus, and terminated by large nails, almost resembling hoofs. This number of toes is the inverse of that most common among the rats. Their inferior incisors are truncated, and not pointed like those of the true Jerboas, and of the greater part of the animals comprised under the genus of rats. One species only is known, the

H. Caffer. It is the size of a hare, of a light fawn colour, and has a long tufted tail, with a black tip. Inhabits deep burrows at the Cape of Good Hope.

Spalax, *Gulden.*

The *Rat Moles* have also been very properly separated from the Rats, although their grinders are three in number, and tuberculous, as in the true Rats, and the Hamsters, and are merely a little less unequal. Their incisors, however, are too large to be covered by the lips, and the extremities of the lower ones are trenchant, rectilinear, and transverse, not pointed. Their legs are very short; each foot has five short toes, and as many flat and slender nails. Their tail is very short, or rather there is none; the same observation applies to their external ear. They live under ground like the moles, raising up the earth like them, although provided with much inferior means for dividing it; but they subsist on roots only.

S. typhus. (The Zanni, Slepez, or Blind Rat-Mole.) A singular animal, which, from its large head, angular on the sides, its short legs, the total absence of a tail and of any apparent eye, has a most shapeless appearance. The eye is not visible externally, and we merely find beneath the skin a little black point, which appears to be organised like one, but which cannot serve for the purpose

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* *Pedetes*, Jumper; *Helamys*, Jumping-Rat.

of vision, since the skin passes over it without opening or even growing thinner, and being as much covered with hair as any other part. It is rather larger than our rat; its fur is smooth, and of an ash-colour, bordering on a red. This is the animal, in the opinion of Olivier, to which the ancients alluded when they spoke of the mole as being perfectly blind.

From the Rat-Moles themselves should have been separated the

Bathyergus, *Illiger*,—Orycteres, *Fr. Cuvier*,

Which, with the general form, feet, and truncated incisors of that genus, have four grinders throughout. Their eye, though small, is visible, and they have a short tail.

B. maritimus. (The Maritime Rat-Mole.) Nearly the size of a rabbit; the superior incisors furrowed with a groove, and the hair of a whitish grey.

Geomys, *Rafinesque*—Pseudostoma, *Say*.

Which have four compressed prismatic molars throughout, the first double, the remaining three simple; the upper incisors furrowed with a double groove in front; five toes to each foot; the three middle anterior nails. that of the medius particularly, very long, crooked, and trenchant. They are low animals, and have very deep cheek-pouches, which open externally, enlarging the sides of the head and neck in a singular manner. One species only is known,

G. bursarius. (The Canada Hamster.) Size of a rat; fur of a reddish-grey; tail naked, and but half the length of the body. Inhabits deep burrows in the interior of North America.

Diplostoma, *Rafinesque*.

The Diplostomæ are almost precisely similar to the Geomys, but they have no tail. These animals are also from North America. The species before us is reddish, and ten inches in length.

We now pass to larger Rodentia than those of which we have hitherto spoken, but of which several still have well defined clavicles. Of this number is the

Castor, *Linnæus*.

The *Beavers* are distinguished from all other Rodentia by their horizontally flattened tail, which is nearly of an oval form, and covered with scales. They have five toes to each foot: those of the hinder ones are connected by membranes, and that next to the thumb has a double and oblique nail. Their grinders, to the number of four throughout, and with flat crowns, appear as if formed of a doubled bony fillet, or so as to show one sloping edge at the internal extremities of the upper row, and three at the external; in the lower ones it is exactly the reverse.

Beavers are large animals, whose life is completely aquatic; their feet and tail aid them equally in swimming As their chief food is bark, and other hard

substances, their incisors are very powerful, and grow as rapidly from the root as they are worn away at the point. With these teeth they cut trees of every description.

They have large glandular pouches, which produce a highly odorous oily substance, employed in medicine under the name of *Castor oil.*

C. fiber, Buff. (The Beaver.) Larger than the badger, and of all quadrupeds the most industrious in constructing a dwelling, to effect which these animals act in concert. They are found in the most solitary parts of North America.

Beavers choose water of such a depth as is not likely to be frozen to the bottom, and, as far as possible, running streams, in order that the wood which they cut above, may be carried downwards by the current to the spot where it is to be used. They keep the water at an equal height, by dams composed of branches of trees, mixed with clay and stones, the strength of which is annually increased, and which finally, by the progress of vegetation, becomes converted into a hedge. Each hut serves for two or three families, and consists of two stories; the upper is dry for the residence of the animals, and the lower under water for their stores of bark, &c. The latter alone is open, and the entrance is under water, having no communication with the land. The huts are a kind of rude wicker-work, being made of interwoven branches and twigs of trees plastered with mud. There are always several burrows along the bank, in which they seek for shelter when their huts are attacked. They only reside in these habitations during the winter: in the summer they separate, and live a solitary life. The Beaver may be easily tamed, and accustomed to feed on animal matter. It is of a uniform reddish brown colour, and the fur, as is well known, is in great demand for hatters. It is sometimes found flaxen-coloured, at others black, or even white.

Myopotamus, *Comaner.*

The *Couias* resemble the Beaver in size, in their four nearly similarly composed molars, in their powerful yellow-tinted incisors, and in their five-toed feet, the hinder ones of which are palmated; but their tail is round and elongated. They are aquatic animals also. One only is known, the

M. coipus. (The Couia.) Which lives in burrows along the banks of rivers throughout a great part of South America.

Hystrix, *Linnæus.*

The *Porcupines* are known at the first glance by the stiff and sharp spines, or quills (as they are called), with which they are armed, like the hedge-hogs among the Carnaria. Their grinders are four throughout, with flat crowns, variously modified by plates of enamel, between which are depressed intervals. Their tongue is bristled with spiny scales, and their clavicles are too small to rest upon the sternum and scapula, being merely suspended by ligaments.

They live in burrows, and have many of the habits of the rabbit. To their grunting voice, and thick truncated muzzle, are they indebted for being compared to the pig, and for their corresponding French appellation of *porc-epic*.

Porcupines, properly so called,

Have the head more or less convex or vaulted, by the development of the bones of the nose. They have four toes before, and five behind, all armed with stout nails.

H. cristata. (The Common Porcupine.) Inhabits the south of Italy, Spain, and Sicily; it is also found in Barbary. The spines are very long, and annulated with black and white; a mane composed of long hairs occupies the head and neck. The tail is short, and furnished with hollow truncated tubes, suspended to slender pedicles, which make a noise when shaken by the animal. We separate from the true porcupines the

Atherurus, *Cuvier*.

Where neither the head nor muzzle is inflated, and in which we observe a long non-prehensile tail; the toes are like those of the true porcupines.

Hyst. fasciculata, Lin., Buff. (The Pencil-tailed Porcupine.) The upper part of the spines on the back grooved, and the tail terminated by a bundle of flattened horny slips, constricted from space to space.

Eretison, *F. Cuvier*.

The *Ursons* have a flat cranium; the muzzle short, and not convex; the tail of a middle size, and the spines short, and half hidden in the hair. One species only is known, the

Hystrix dorsata, Lin. (The Urson.) From North America.

Synetheres, *F. Cuvier*.

The muzzle short and thick; the head vaulted in front, and the spines short; the tail long, naked at the extremity, and prehensile, like that of an Opossum or Sapajou. There are only four toes, all armed with claws; they climb trees.

Lepus, *Linnæus*.

Hares have a very distinctive character in their superior incisors, which are double, that is, each of them has a smaller one behind it. Their molars, five every where, are individually formed of two vertical laminæ soldered together, and in the upper jaw there is a sixth, simple and very small. They have five toes before and four behind. The inside of their mouth and the under part of the feet are lined with hairs like the rest of the body.

Lepus, *Cuvier*,

Or the *true Hares*, have long ears; a short tail; the hind feet much longer than the fore ones; imperfect clavicles, and the infra-orbitary spaces in the

skeleton reticulated. The species are so numerous and similar, that it is difficult to characterise them.

L. Americanus, Gm. (The American Rabbit.) Nearly similar in size and colour to the European species; feet reddish; no black on either ears or tail. Nestles in the hollows of trees, up which it sometimes ascends as far as the branches. Flesh soft and insipid.

Lagomys, *Cuvier**.

Rat-Hares have moderate ears; legs nearly alike; the hole below the eye simple; clavicles nearly perfect, and no tail; they often utter a sharp cry. They have hitherto been found in Siberia only, and it is to Pallas that we are indebted for their discovery. This author describes several species, varying in size and colour, and also in their habits and locality.

The fossil bones of an unknown species of Lagomys have been discovered in the *osseous breccia* of Corsica.

After the two genera of Porcupines and Hares, come those Rodentia united by Linnæus and Pallas under the name of Cavia; but to which it is impossible to affix any other common and positive character than that of their imperfect clavicles, although the species of which they are composed are very analogous to each other, both in body and habits. They are all from the western continent.

Hydrochœrus, *Erxleben*. (2)†

Four toes before and three behind, all armed with large nails, and united by membranes; four grinders throughout, of which the posterior are the longest, and composed of numerous simple and parallel laminæ; the anterior laminæ forked towards the external edge in the upper, and towards the internal one in the lower teeth. Only one species is known, the *Capybara*, which inhabits the rivers of Guiana and the Amazon, where they live in troops.

Cavia, *Illiger*.—Anœma, *Fr. Cuvier*.

The *Cobayes*, or *Guinea-Pigs*, are miniature representations of the Cabiais; but their toes are separated, and each of their molars has only one simple lamina, and one that is forked on the outside in the upper ones, and on the inside in the lower. The best known species is the *Mus porcellus*, Lin.; is now very common in England and the rest of Europe; where it has been domesticated; it varies in colour. It is found wild in the woods of Brazil and Paraguay.

Kerodon, *F. Cuvier*.

The *Mocos* have rather simpler grinders than the Cobayes, each being formed of two triangular prisms. The only species known is from Brazil; it is somewhat larger than the Guinea-Pig, and is of an olive grey.

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* *Lagomys*, i. e. Rat-Hares. † *Hydrochœrus*, Water-Pig.

Chloromys, *Fr. Cuvier**.

The *Agoutis* have four toes before and three behind; four grinders throughout, almost equal, with flat crowns irregularly furrowed, rounded borders notched on the internal edge in the upper jaw, and on the external one in the lower. In disposition, and in the nature of their flesh, they resemble hares and rabbits, which they may be said to replace in the Antilles and hot parts of America.

Cœlogenys, *Fr. Cuvier*†.

The *Pacas*, in addition to teeth very like those of the Agoutis, have a very small toe on the internal edge of the fore foot, and one on each side equally small on their hinder one, making five toes every where. Besides this, there is a cavity formed by a very large and projecting zygomatic arch, which gives a very extraordinary aspect to the bony head. Their flesh is said to be very good.

There is one species or variety fawn-coloured, and another brown, both of which are spotted with white; the *Cavia paca*, Lin.

Finally, there remains an animal perhaps nearly allied to the Cavias, and possibly more so to the Lagomys or the Rats, which we are unable to dispose of, on account of our ignorance of its teeth; I mean the *Chinchilla*, thousands of whose skins are to be had, but of which we have never yet been able to procure the entire body. It is about the size of a small rabbit; is covered with long, close, and fine hair, the softest that is known among common furs. This quadruped inhabits the mountains of South America.

ORDER VI.

EDENTATA.

The Edentata, or quadrupeds *without front teeth*, will form our last order of unguiculated animals. Although united by a character purely negative, they have, nevertheless, some positive mutual relations, and particularly large nails, which embrace the extremities of the toes, approaching more or less to the nature of hoofs; a slowness, a want of agility, obviously arising from the peculiar organisation of their limbs. There are, however, certain intervals in these relations, which render it necessary to divide the order into three tribes. The first of these is the

TARDIGRADA.

They have a short face. Their name originates from their excessive slowness, the consequence of a construction truly heteroclite, in which nature

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* *Chloromys*, Yellow-Rat. † *Cœlogenys*, Hollow Cheek.

seems to have amused herself by producing something imperfect and grotesque. The only genus now in existence is

Bradypus, *Lin.*

The *Sloths* have cylindrical molars, and sharp canini longer than those molars, two mammæ on the breast, and fingers united by the skin, and only marked externally by enormous compressed and crooked nails, which, when at rest, are always bent towards the palm of the hand, or the sole of the foot. The hind feet are obliquely articulated on the leg, and rest only upon their outer edge; the phalanges of the toes are articulated by a close ginglymus, and the first, at a certain age, becomes soldered to the bones of the metacarpus or metatarsus, which also, in time, for want of use, experience the same fate. To this inconvenience in the organisation of the extremities is added another, not less great, in their proportions. The pelvis is so large, and their thighs so much inclined to the sides, that they cannot approximate their knees. Their gait is the necessary effect of such a disproportioned structure. They live in trees, and never remove from the one they are on until they have stripped it of every leaf, so painful to them is the requisite exertion to reach another. It is even asserted that to avoid the trouble of a regular descent, they let themselves fall from a branch. The female produces but a single young one at a birth, which she carries on her back.

Bradypus tridactylus, Lin. (The Aï.) A species in which sluggishness, and all the details of the organisation which produce it, are carried to the highest degree. The thumb and the little toe, reduced to small rudiments, are hidden under the skin, and soldered to the metatarsus and metacarpus; the clavicle, also reduced to a rudiment, is firmly united to the acromion. The arms are double the length of the legs; the hair on the head, back, and limbs is long, coarse, and non-elastic, something like dried hay, which gives it a most hideous aspect. Its colour is grey, the back being frequently spotted with white and brown. It is as large as a cat, and is the only mammiferous animal known which has nine cervical vertebræ.



F. Cuvier applies the name of Bradypus to those species only which have two nails to the fore feet; the Cholæpus. *Illig.* Their canini are larger and more pointed, and they are wholly destitute of a tail; only one species is known, the Unau (*B. didactylus*, Lin.), less uniform in its organisation than the Aï, and considerably larger. These animals are natives of the hot parts of America, and possess powerful means of defence in their nails against the carnivorous animals of that country.

Fossil skeletons of two Edentata of great size have been discovered in America, one of which, the Megatherium, has a head very similar to that of the sloths, but deficient as to canini, and approaching in other parts of the skeleton partly to the sloths, and partly to the ant-eaters. It is twelve feet long, and six or seven high. The other, the Megalonyx, is rather smaller

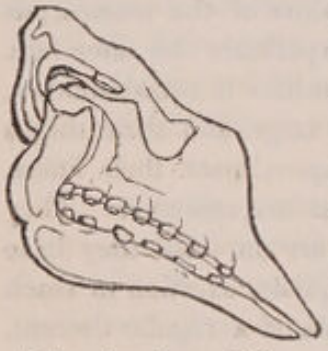
and the toes are the only parts of it that are well known, but they strongly resemble those of the preceding.

The second tribe comprehends the

EDENTATA ORDINARIA,

Or the Ordinary Edentata, with a pointed muzzle. Some of them still have cheek teeth. They form two genera.

DASYPUS, *Lin.*



The *Armadillos* are very remarkable among the mammalia, for the scaly and hard shell formed of compartments resembling little paving stones, which covers their head and body, and frequently their tail. This substance forms one shield over the forehead, a second very large and convex over the shoulders, a third on the croup similar to the second, and between the two latter several parallel and moveable bands, which allow the body to bend. The tail is sometimes furnished with successive rings, and at others, like the legs, merely with tubercles. These animals have large ears, and sometimes four, and at others five great nails before, but always five behind. The muzzle pointed, the grinders cylindrical, seven or eight in number, separated from each other, and without enamel inside. They dig burrows, and live partly on vegetables, and partly on insects and dead bodies. They all belong to the hot or at least to the temperate parts of America.

They may be divided into subgenera from considerations drawn from the structure of their fore feet and the number of their teeth. Most of them have only four toes to the anterior feet, the two middle ones of which are the longest. These subgenera are—

APARA, Cuv. (3-banded Armadillo); ENCOUBERTUS, Cuv. (6-banded Armadillo); CABASSOUS, Cuv. (The Tatouay); PRIODON, Fr. Cuv. (The Giant Armadillo); and the CLAMYPHORUS, Harl., of which only one is known, the *C. truncatus*, Harl.

It appears that the fossil bones of a *Tatou* of gigantic size, being ten feet long exclusive of the tail, have been found in America. See Cuv. Oss. Foss. V. part 1, p. 191, note.

ORYCTEROPUS, *Geoffroy**.

The animals of this genus were for a long time confounded with the ant-eaters on account of their using the same kind of food, having a similar head, and a tongue somewhat extensible; but they are distinguished from them by being furnished with grinders and flat nails, formed for digging,

* *Orycteropus*, feet fitted for digging.

and not trenchant. The structure of their teeth differs from that of all other quadrupeds; they are solid cylinders traversed like reeds, in a longitudinal direction, with an infinitude of little canals. There is only one species known.

Oryct. Capensis. (The Cape Ground Hog.) It is an animal about the size of the badger, or larger; stands low; has short hair, and is of a brownish grey. The tail is not so long as the body, and is covered with equally short hairs. It has four toes before, and five behind. Inhabits burrows, which it excavates with great facility. The flesh is eaten.

The other ordinary Edentata have no grinders, and consequently no teeth of any description. They also form two genera.

Myrmecophaga, *Linnæus.*

The *Ant-eaters* are hairy animals with a long muzzle terminated by a smooth toothless mouth, from which is protruded a filiform tongue susceptible of considerable elongation, and which they insinuate into ant-hills and the nests of the Termites, whence these insects are drawn by being entangled in the viscid saliva that covers it. The nails of the fore feet, strong and trenchant, and varying in number according to the species, serve to tear up the nests of the Termites, and afford the means of defence.



They all inhabit the hot and temperate parts of the western continent, and produce but a single young one at a birth, which they carry on their back.

Manis, *Linnæus.*

The *Pangolins*, or *Scaly Ant-Eaters*, as they are called, are destitute of teeth, have a very extensile tongue, and live on ants and termites like true ant-eaters; but their body, limbs, and tail are clothed with large trenchant scales arranged like tiles, which they elevate in rolling themselves into a ball, when they wish to defend themselves from an enemy. There are five toes to each foot. Their stomach is slightly divided in the middle, and there is no cæcum. They are confined to the eastern continent.



The third tribe of the Edentata comprehends those animals, designated by M. Geoffroy, under the name of

MONOTREMATA.

The singularities of their skeleton are very remarkable: a sort of clavicle, which is common to both shoulders, being placed before the ordinary clavicle, and analogous to the fourchette in birds. Finally, besides their five nails to each foot, the males have a spur on the hinder ones, perforated by a canal which transmits the liquid secreted by a gland situated on the inner surface of the thigh. It is asserted that the wounds it inflicts are envenomed. These animals have no external conch to their ears, and their eyes are very small.

The Monotremata are only found in New Holland, and have been discovered since the settlement of the English. Two genera of them are known.

Echidna, *Cuv.*

The elongated slender muzzle of the *Spiny Ant-Eaters*, terminated by a small mouth, contains an extensible tongue similar to that of the Ant-Eaters and Pangolins, and, like them, they feed on ants. They have no teeth, but their palate is furnished with several rows of small recurved spines. Their short feet have each five very long and stout nails fitted for digging; and the upper surface of the body is covered with spines like that of the hedgehog. It appears that, when in danger, they also possess the faculty of rolling themselves into a ball. There are two species.

E. hystrix. (The Spiny Echidna.) Completely covered with large spines.

E. setosa. (The Bristly Echidna.) Is covered with hair, among which the spines are half hidden. Some naturalists consider it as a mere variety from age.

Ornithorhynchus, *Blumenbach.*—Platypus, *Shaw.*

The elongated, and at the same time singularly enlarged and flattened muzzle of the Ornithorhynchi presents the closest external resemblance to the bill of a duck, and the more so as its edges are similarly furnished with small transverse laminæ. There is a membrane to the fore feet, which not only unites the toes, but extends far beyond the nails; in the hind feet the membrane terminates at the root of the nails; two characters, which, with the flattened tail, make them aquatic animals. The Ornithorhynchi inhabit the rivers and marshes of New Holland in the neighbourhood of Port Jackson.





Two species only are known, one with smooth, thin, reddish fur, the *Ornithorhynchus paradoxus*, Blumenb.; and the other with blackish-brown flat and frizzled hair. Probably these are only varieties of age.

ORDER VII.

PACHYDERMATA*.

The Edentata terminate the series of unguiculated animals, and we have just seen that there are some of them whose nails are so large, and so envelope the extremities of the toes, as to approximate them in a certain degree to the hoofed animals. They still, however, possess the faculty of bending

* Thick-skinned animals.

these toes round various objects, and of seizing with more or less force. The total deficiency of this faculty characterises the hoofed animals. Their forms and habits present much less variety than those of the Unguiculata, and they can hardly be divided into more than two orders, those which ruminate, and those which do not; but these latter, which we designate collectively by the term *Pachydermata*, admit of subdivision into families.

The first is that of the Pachydermata which have a proboscis and tusks.

FAMILY I.

PROBOSCIDIANA.

The *Proboscidians* have five toes to each foot, very complete in the skeleton, but so encrusted by the callous skin which surrounds the foot, that their only external appearance is in the nails attached to the edge of this species of hoof. They have no canini or incisors properly so called, but in their incisive bone are implanted two tusks, which project from the mouth, and frequently attain to an enormous size. The magnitude requisite for the alveoli of these tusks renders the upper jaw so high, and so shortens the bones of the nose, that the nostrils in the skeleton are placed near the top of the face; but in the living animal they are continued out into a cylindrical trunk or proboscis, composed of several thousands of small muscles, variously interlaced, extremely flexible, endowed with the most exquisite sensibility, and terminated by an appendage resembling a finger. This proboscis is to the elephant what the hand is to the monkey. With it he seizes every thing he wishes to convey to his mouth, and sucks up the water he is to drink, which, by the flexure of this admirable organ, is then poured into his throat; thus supplying the want of a long neck, whose weakness would have rendered it unable to support so large a head and such heavy tusks. Within the parietes of the cranium, however, are several great cavities, which render the head lighter; the lower jaw has no incisors whatever; the intestines are very voluminous, the stomach simple, and the mammæ, two in number, placed under the chest; the young suck with the mouth, and not the trunk.



But one living genus of the Proboscidiana is known, that of

Elephas, *Linnæus*,

Or the *Elephant*, which comprehends the largest of the terrestrial Mammalia. After studying the habits of these animals for a long time, we have not found them to surpass the dog, and some of the other carnivorous animals, in intelligence. The Elephant is naturally of a mild disposition; they live in herds, which are conducted by old males.

Their distinctive character consists in the grinders, the bodies of which are composed of a certain number of vertical laminæ, each one being formed of a bony substance, enveloped with enamel, and cemented together by a third substance called cortical; in a word, similar to those already described in the cabiais, and other Rodentia. Their grinders succeed each other, not vertically, or as our permanent teeth succeed the first ones, but from behind; so that as fast as one tooth becomes worn, it is pushed forward by that which comes after it. Hence it happens that the elephant has sometimes one, sometimes two grinders on each side. Their food is strictly vegetable.

The elephants of the present day, clothed with a rough skin nearly destitute of hair, are only found in the torrid zone of the eastern continent, where hitherto only two species have been ascertained.

E. Indicus, Cuvier. (The Elephant of India.) An oblong head; the crown of the grinders presenting transverse undulating fillets, which are sections of the laminæ which compose them worn by trituration. This species has rather smaller ears than the next one, and has four nails to the hind foot. It is found from the Indus to the Eastern Ocean, and in the large islands in the south of India. They have been used from the earliest ages as beasts of draught and burden. The females have very short tusks, and in this respect many of the males resemble them.

E. Africanus, Cuvier. (The African Elephant.) A round head; convex forehead; large ears; the crowns of the grinders divided into lozenges. Found from Senegal to the Cape of Good Hope. The tusks of the female are as large as those of the male, and the weapon itself, generally speaking, is larger than in the Indian species. The African Elephant is not now tamed, though it appears that the Carthaginians employed it in the same way that the inhabitants of India do theirs.

The second genus of the Proboscidiana is the

Mastodon, *Cuvier.*

The *Mammoth* has been completely destroyed, nor is there a single individual living. It had the feet, tusks, trunk, and many other details of conformation in common with the elephant; but differed from it in the grinders. Two species have been found—

M. giganteum. The Great Mastodon, in which the sections of the points are lozenge-shaped, is the most celebrated species. It equalled the elephant in size, but with still heavier proportions. Its remains are found in a wonderful state of preservation, and in great abundance throughout all parts of North America. They are infinitely more rare in the eastern continent. The *M. angustidens* was a third less than the Great Mastodon, and much lower on its legs. Its remains are found throughout the greater part of Europe and of South America. In certain places, the teeth, tinged with iron, become of a beautiful blue when heated, forming what is called the oriental turquoise.



FAMILY II.

PACHYDERMATA ORDINARIA,

Or the *Ordinary Pachydermata,* have four, three, or two toes.

Those in which the toes make even numbers have feet somewhat cleft, and approximate to the Ruminantia in various parts of the skeleton, and even in the complication of the stomach. They are usually divided into two genera.

HIPPOPOTAMUS, *Linnæus.*

These animals have a very massive and naked body; very short legs; the belly reaching to the ground; an enormous head terminated by a large inflated muzzle, which encloses the apparatus of their large front teeth; the tail short; the ears and eyes small. They live in rivers, upon roots and other vegetable substances, and exhibit much ferocity and stupidity. One species only is known.

H. amphibius. (The Hippopotamus.) Now confined to the rivers of the middle and south of Africa.

SUS, *Linnæus.*

Hogs, properly so called, have twenty-four or twenty-eight grinders, of which the posterior are oblong with tuberculous crowns, and the anterior more or less compressed, and six incisors in each jaw.

S. scrofa, Lin. The Wild Hog, which is the parent stock of our Domestic Hog and its varieties, has prismatic tusks that curve outwards and slightly upwards; the body short and thick; straight ears; the hair bristled and black; the young ones striped black and white. It does great injury to fields in the vicinity of forests, by tearing up the ground in search of roots. Naturalists now separate from the Hogs the subgenera *Phacochærus,* and *Dicotyle* or the Peccaries.

Here may come a genus now unknown in the living creation, which we have discovered, and named

ANOPLOTHERIUM.

It presents the most singular affinities with the various tribes of the Pachydermata, and approximates in some respects to the order of the Ruminantia.

The bones of this genus have hitherto only been found in the gypsum quarries near Paris. We have already ascertained five species.

RHINOCEOS, *Linnæus.*

The ordinary Pachydermata which have not cloven feet comprehend, in the

first place, three genera, very similar to each other in their grinders, but their incisors vary.

The species of this genus, in this particular, even vary among themselves.



They are large animals; each foot is divided into three toes; and the bones of the nose, which are very thick and moulded into a sort of arch, support a solid horn which adheres to the skin, and is composed of a fibrous and horny substance, resembling agglutinated hairs. They are naturally stupid and ferocious, frequent marshy places, and feed on herbs and branches of trees. They are found in India, Java, Africa, and Sumatra.



Rh. Indicus, Cuv. (The Rhinoceros of India.) Has but one horn, and the skin is remarkable for the deep folds into which it is thrown behind and across the shoulders, and before and across the thighs. It has, in addition to its twenty-eight grinders, two strong incisors in each jaw, two other small ones between the lower, and two still smaller again outside the upper one. It inhabits the East Indies, and chiefly beyond the Ganges. The Rhinoceros of Java, (*Rh. Javanus*, Cuv.) differs from the Indian species, in having fewer folds in the skin, and by having the whole skin covered with small compact angular tubercles. It has hitherto only been found in Java.

Rh. Africanus, Cuv. (The Rhinoceros of Africa.) Furnished with two horns; has no fold of the skin, nor any incisor teeth, its molars occupying nearly the whole length of the jaw.

Various fossil species are found in Siberia, Tuscany, and different parts of Germany. A body, nearly entire, was taken from the ice on the banks of Vilhoui in Siberia, having two horns, and the cranium much more elongated than in any living species, and having a bony vertical partition supporting the bones of the nose, which must have been covered with tolerably thick hair. Some of the bones, found in France, announce a body hardly larger than the hog.

Hyrax, *Herm.*

The *Damans*, as they are termed, have long been placed among the Rodentia, on account of their small size; if, however, we examine them closely, we shall find, the horn excepted, that they are Rhinoceroses in miniature, at least they have similar molars; but their upper jaw is furnished with two strong incisors curved downwards, and at an early age with two very small canini; the lower one has four incisors, but no canini.

Palæotherium, *Cuvier.*

This is also a lost genus, with the same grinders as the two preceding, six incisors, and two canini in each jaw like the tapirs, with three visible toes to each foot; they had also, like the tapirs, a short fleshy proboscis. We

discovered the bones of this genus mixed with those of the anoplotherium in the gypsum quarries near Paris. They also exist in many other parts of France. Eleven or twelve species are known already.

Lophiodon, *Cuvier*,

Is another lost genus, which appears to be closely allied to the preceding one. Ten or twelve species have been extracted from our old fresh water formations, the same as those in which the palæotherium is found.

To these genera should succeed the genus

Tapir, *Linnæus*,

In which the twenty-seven molars, before they are worn, present two transverse and rectilinear prominences; in the front of each jaw are six incisors and two canini, separated from the molars by a vacant space.

The nose resembles a small fleshy proboscis; there are four toes to the fore feet, and three to the hind ones. For a long time but a single species was known, the American Tapir. (*T. Americanus*, Linnæus.) Size of a small ass; skin brown and nearly naked; tail moderate; neck fleshy, forming a sort of crest on the nape. Common in wet places, and along the rivers of the warm parts of South America. The flesh is eaten. Within a few years a second species has been discovered in the eastern continent, which is larger than that of America, of a blackish brown colour, with the back whitish grey. It is found in the forests of Malacca and Sumatra. A third species has lately been discovered in the Cordilleras the back of which is covered with hair, and the bones of the nose more elongated, and approximating somewhat to the palæotherium.



Head and feet of the Tapir.

Fossil Tapirs are also scattered throughout Europe; and among others is a gigantic species, which in size must have nearly equalled the elephant; it is the *T. giganteus*, Cuv.

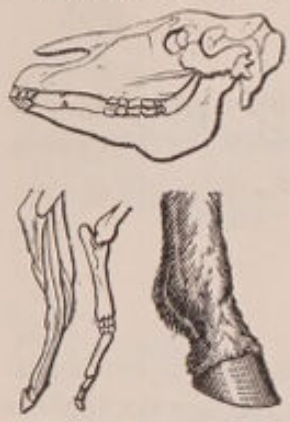
FAMILY III.

SOLIPEDES.

The Solipedes are quadrupeds which have only one apparent toe, and a single hoof to each foot, although under the skin, on each side of their metatarsus and metacarpus, there are spurs representing two lateral toes. One genus only is known, that of

Equus, *Linnæus.*

The *Horse* has six incisors in each jaw. The male has also two small additional canini in the upper jaw, and sometimes in both, which are almost always wanting in the female. Between these canini and the first molar is that unoccupied space which corresponds to the angle of the lips, where the bit is placed, by which alone man has been enabled to subdue and tame this powerful animal.



Head and foot of the Horse.

E. caballus, Lin. (The Horse.) This noble associate of man, in the chase, in war, and in the works of agriculture, the arts, and commerce, is the most important and carefully attended of all the animals he has subdued. It does not seem to exist in a wild state at the present time; those places excepted, where horses formerly domesticated have been set at liberty, as in Tartary and America, where they live in troops, each of which is led and defended by an old male. The horse's age is known by the incisors. The milk teeth begin to grow about fifteen days after the colt is foaled; at two years and a half the middle ones are replaced; at three and a half the two next ones, and at four and a half the outermost or corner ones; all these teeth have originally an indented crown, which they gradually lose by detrition; when seven or eight years old, this is entirely removed, and the horse is no longer marked; the lower canini are produced at three and a half, the upper ones at four; they remain pointed till six, and at ten they begin to peel off.

Every one knows how much this animal varies in size and colour. The principal races exhibit sensible differences in the form of the head, and in their proportions; the most beautiful and swift is the Arab; the largest and strongest are from the coast of the North Sea, and the smallest of the race from the north of Sweden and Corsica.

E. hemionus. (The Dziggetai.) A species which, as to its proportions, is intermediate between the horse and the ass, and lives in troops in the sandy deserts of Central Asia. It is of a cream colour, with a black mane, and a dorsal line of the same colour; the tail is terminated by a black tuft. It is probably the wild mule of the ancients.

E. asinus. (The Ass.) Known by its long ears, the tuft which terminates the tail, and the black cross on the shoulders, which is the first indication of the stripes which distinguish the following species. Originally from the great deserts of Central Asia, it is still to be found there in a wild state, and in innumerable troops, ranging from north to south, according to the season; hence it thrives but poorly in the more northern climates. The hoarseness of its voice, or bray, depends upon two small peculiar cavities situated at the bottom of the larynx.

E. zebra. (The Zebra.) Nearly the same form as the ass; the whole animal regularly marked with black and white transverse stripes; originally from the whole South of Africa.

E. quaccha. (The Couagga.) Resembles the horse more than the zebra, but comes from the same country. The hair on the neck and shoulders is brown, with whitish transverse stripes; the croup is of a reddish grey; tail and legs whitish. The name is expressive of its voice, which resembles the barking of a dog.

E. montanus. (The Onagga.) An African species, smaller than the ass, but having the beautiful form of the Couagga; its colour is a very light bay, with black stripes, alternately wider and narrower, on the head, neck, and body. Those behind slant obliquely forwards; legs and tail white.

ORDER VIII.

RUMINANTIA.

The term Ruminantia indicates the singular faculty possessed by these animals of masticating their food a second time, by bringing it back to the mouth after a first deglutition. This faculty depends upon the structure of their stomachs, of which they always have four, the three first being so disposed that the food may enter into either of them, the œsophagus terminating at the point of communication.



The first and largest, *a*, is called the *paunch;* it receives a large quantity of vegetable matter coarsely bruised by mastication. From this the food passes into the second, *e*, called the *honeycomb*, or *bonnet*, the parietes of which are laminated like a honeycomb. This second stomach seizes the food, moistens and compresses it into little pellets, which afterwards successively ascend to the mouth to be rechewed. The aliment thus remasticated descends directly into the third stomach, *b*, called the leaflet (*feuillet*), which is longitudinally laminated, or like the leaves of a book; and thence to the fourth stomach, *c*, the *caillette*, the sides of which are wrinkled, and which is the true organ of digestion.

CAMELUS, *Linnæus.*

The *Camels* approximate to the preceding order rather more than the others. They not only always have canini in both jaws, but they also have two pointed teeth implanted in the incisive bone, six inferior incisors and from eighteen to twenty molars only; peculiarities, which, of all the Ruminantia, they alone possess. Instead of the large hoof flattened on its internal side which envelopes the whole inferior portion of each toe, and which determines the figure of the common cloven-foot, they have but one small one, which only

adheres to the last phalanx, and is symmetrically formed like the hoofs of the Pachydermata.

CAMELUS, *Cuvier.*

Camels, properly so called, have the two toes united below, nearly to the point, by a common sole, and the back furnished with lumps of fat. They are large animals of the eastern continent, of which two species are known, both completely reduced to a domestic state.

C. Bactrianus. (The Two-humped Camel.) Originally from central Asia, and which descends to the south much less than the

C. dromedarius, (the Dromedary,) which has spread from Arabia into all the north of Africa, a great part of Syria, Persia, &c.

AUCHENIA, *Illiger.*

The *Lamas* have the two toes separate; they are without humps. Only two distinct species are known; the Lama, (*C. llacma,* Lin.) and the Paco, (*C. viccunna,* Lin.) both from the Western continent, and much smaller than the two preceding ones. The first was the only beast of burden in Peru at the time of the conquest. It will carry a hundred and fifty pounds, but can only make short journeys; the latter is covered with fawn-coloured wool, extremely soft and fine, of which valuable stuff is manufactured.

MOSCHUS, *Linnæus.*

The *Musks* are much less anomalous than the camels, differing from the ordinary Ruminantia only in the absence of horns, in having a long canine tooth on each side of the upper jaw, which in the male issues from the mouth; and finally in having a slender peronæus, which is not found even in the camel. These animals are remarkably light and elegant.



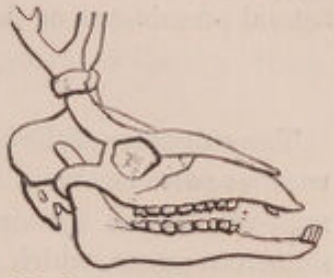
M. moschiferus, Lin.; Buff. (The Musk.) This is the most celebrated species, and the size of a goat, has scarcely any tail, and is completely covered with hairs so coarse and brittle that they might be termed spines.

All the rest of the Ruminantia, the males at least, have two horns; that is to say, two prominences of the frontal bones, which are not found in any other family of animals.

In some, these prominences are covered with an elastic sheath composed as if with agglutinated hairs, which increases by layers during their life; the name of *horn* is applied to the substance of this sheath, and the sheath itself is called the *corne creuse,* or horn mould. The prominence it envelopes grows with it, and never falls. Such are the horns of *oxen, sheep, goats,* and *antelopes.*

In others, the prominences are only covered with a hairy skin, continuous with that of the head; nor do the prominences fall, those of the giraffe excepted.

Finally, in the genus of the Stags, the prominences covered for a time with a hairy skin, similar to that on the rest of the head, have at their base a ring of bony tubercles, which, as they enlarge, compress and obliterate the vessels of that skin. It becomes dry, and is thrown off; the bony prominences, being laid bare, at the expiration of a certain period separate from the cranium, to which they were attached; they fall, and the animal remains defenceless. Others, however, are re-produced, generally larger than before, and destined to undergo the same fate. These horns, purely osseous, and subject to periodical changes, are styled *antlers*.



Cervus, *Linnæus.*

The *Stags*, consequently, are the only Ruminantia which have heads armed with antlers; the females, however, the rein-deer alone excepted, are always without them. The substance of these antlers, when completely developed, is that of a dense bone, without pores or sinus.

C. alces, Lin. (The Moose.) As large as a horse, and sometimes larger; stands very high; the muzzle cartilaginous and inflated; a sort of goitre, or pendulous swelling, variously shaped, under the throat; hair always very stiff and of a more or less deep ash-colour. Their horns increase with age so as to weigh fifty or sixty pounds, and to have fourteen branches to each horn. The moose lives in small troops, and inhabits the marshy forests of the north of both continents. Its skin is valuable for various purposes.

C. tarandus, Lin., Buff. (The Rein-deer.) Size of a stag, but has shorter and stouter legs; both sexes have antlers, divided into several branches, at first slender and pointed, and terminating by age in broad denticulated palms. There are various species of this genus; such as the fallow deer, common stag, Virginia deer, axis, roebuck, &c.

Camelopardalis, *Linnæus.*

The *Giraffe* is characterised in both sexes by conical horns, as represented in the cut, always covered with a hairy skin, and which are never shed. On the middle of the chanfrin is a tubercle or third horn, broader and much shorter, but likewise articulated by a suture. It is moreover one of the most remarkable animals in existence, from the length of its neck and the disproportioned height of its fore legs. Only one species is known.



C. giraffa, F. Cuv. (The Giraffe.) It is confined to the deserts of Africa, and has short grey hair sprinkled with fawn-coloured angular spots, and a small fawn-coloured and grey mane. It is the tallest of all animals, for its head is frequently elevated eighteen feet from the ground. Its disposition is gentle, and it feeds on leaves. The

RUMINANTIA WITH HOLLOW HORNS

Are more numerous than the others, and we have been compelled to divide them into genera from characters of but little importance, drawn from the form of their horns and the proportions of their different parts. To these

M. Geoffroy has advantageously added those afforded by the substance of the frontal prominence or the bony nucleus of the horn.

Antilope.

The substance of the bony nucleus of the horns of the Antelopes is solid, and without pores or sinus, like the antlers of the stag. They resemble the stags moreover in the lightness of their figure and their swiftness. It is a very numerous genus, which naturalists have divided, and principally according to the form of the horns.

Div. *a.* includes the Gazelle. (*A. dorcas*, Lin.) Has the horns annulated with a double curvature directed forwards, inwards, or upwards. This species inhabits the north of Africa, where they live in large herds. It is the usual prey of the lion and panther. The soft expression of its eye has furnished numerous images to the Arabian poets.

Div. *b.* The Antelope of India. (*A. cervicape*, Pallas.) Is very like the gazelle, but its horns are annulated with a triple curve. They are used in India as weapons.

Div. *c.* The Barbary Cow, (A *bubalis*, Lin.,) belongs to this division; which has the horns annulated, with a double curve, but winding in an opposite direction to those of the preceding division—the points being directed backwards as in the engraving.



Div. *d.* Horns small, straight, or but slightly curved; less than the head. The Woolly Antelope (*A. lanata*, Desmar) belongs to this division.

Div. *e.* Horns annulated with a simple curve, the points directed forwards; the Redunce of Smith.

Div. *f.* Horns annulated, straight or but slightly curved, and larger than the head. The Oxyx, Smith.

Div. *g.* Horns annulated with a simple curve, points directed backwards. The Blue Antelope (*A. leucophæa*, Gm.) belongs to this division.

Div. *h.* Horns encircled with a spiral ridge.

Div. *i.* Horns bifurcated, (*Antilocapre* of Ord; *Dicranoceros*, Hamilton Smith); of all the forms of hollow horns, this is the most singular; a compressed fork is given off from their base or trunk, almost like the tine or antler of a deer; the pointed tips curve backwards.

Div. *k.* Four horns (*Tetracera*, Leach.) This subdivision, lately discovered in India, was not unknown to the ancients. Ælian speaks of it by the name of the four-horned orya: the anterior pair of horns are before the eyes, the posterior pair completely behind the frontal.

Div. *l.* Two smooth horns; to this division belong the Nylgau (*A. pictu*, Gm.), and the Gnu, (*A. gnu*, Gm.) A very singular animal, which at first glance seems composed of parts of different animals. It has the body and croup of a small horse, covered with brown hairs; the tail furnished with long white hairs, like that of a horse; and on the neck a beautiful straight mane, the hairs of which are white at the base and black at the tip. The horns approximated, and enlarged at the base like those of the Cape Buffalo, descend outwardly and turn up at the point; its muzzle is large, flat, and surrounded

with a circle of projecting hairs; under the throat and dew-lap is another black mane: the feet have all the lightness of the stag.

The most remarkable species are the *Gazelle, Springbock, Plunging Antelope, Rock-Springer, Algazel, Chamois, Gnu,* &c.

The three remaining genera have the bony core of the horns principally occupied with cells, which communicate with the frontal sinuses. The direction of their horns furnishes the characters of the divisions.

Capra, *Linnæus.*

The horns of the *Goats* are directed upwards and backwards, the chin generally furnished with a long beard, and the chanfrin almost always concave.

C. ægragus, Gm. (The Wild Goat.) Appears to be the stock of all the varieties of our domestic Goat. It is distinguished by its horns, trenchant in front, very large in the male; short, or altogether wanting, in the female, which is also sometimes the case in the two species of Ibex. It lives in herds on the mountains of Persia (where it is known by the name of *paseng*), and perhaps on those of other countries, even in the Alps. The oriental bezoar is a concretion found in its intestines.

C. ibex, Lin. (The Ibex.) Large horns, square in front, marked with transverse and prominent knots. It inhabits the most elevated summits of the highest ranges of mountains in the whole of the eastern continent.

Ovis, *Linnæus.*

The horns of *Sheep* are directed backwards, and then incline spirally, more or less forwards: the chanfrin is more or less convex, and there is no beard.

Ov. ammon, Lin. (The Argali of Siberia.) The male has very large horns, with the base triangular, angles rounded, flattened in front, and striated transversely; those of the female are compressed and falsiform. To this genus belong the *Mouflons of America, Africa,* and *Sardinia.* This animal inhabits the mountains of all Asia, and attains to the size of the fallow deer.

It is from the Mouflon or the Argali that we are supposed to derive the innumerable races of our woolly animals, which, next to the dog, are most subject to variation.

Bos, *Linnæus.*

The horns of the *Ox* are directed laterally, inclining upwards or forwards, in the form of a crescent; it is a large animal, with a broad muzzle, short and thick body, and stout legs.

B. taurus, Lin. (The Common Ox.) Its specific characters are a flat forehead, longer than broad, and round horns, placed at the extremities of the salient line, or ridge which separates the forehead from the occiput.

B. urus, Gm. (The Aurochs.) Generally, but erroneously, considered as the wild stock of our horned cattle. It is distinguished from them by its convex forehead, which is wider than it is high; by the insertion of its horns below the occipital crest; by the length of its legs; by an additional pair of ribs; by a sort of curly wool, which covers the head and neck of the bull, forming a short beard under the throat; and by its grunting voice. It

is a savage animal, that has now taken refuge in the great marshy forests of Lithuania, of the Krapacs, and of Caucasus, but which formerly inhabited all the temperate parts of Europe. It is the largest quadruped proper to Europe.

B. bison, Lin. (The Buffalo or Bison of America.) The bony head very similar to that of the Aurochs; and, like the Aurochs, it has the head, neck, and shoulders covered with frizzled wool, which becomes very long in winter; its legs and tail are shorter. Inhabits all the temperate parts of North America.

B. bubalus, Lin. (The Buffalo.) Originally from India, and brought into Egypt, Greece, and Italy, during the middle century: has a convex forehead, higher than wide, the horns directed sideways, and marked in front by a longitudinal ridge. This animal is subdued with difficulty. It is extremely powerful, and prefers the marshy grounds, and coarse plants on which the ox could not live. Its milk is good, and the hide very strong, but the flesh is not esteemed.

There is a race of them in India, whose horns include a space of ten feet from tip to tip: it is called *Arni* in Hindostan.

B. grunniens, Pall. (The Yack.) A small species, with the tail completely covered with long hairs like that of the horse, and a long mane on the back. This animal, of which Ælian has spoken, is originally from the mountains of Thibet. Its tail constitutes the standards still used by the Turks to distinguish the superior officers.

B. moschatus, Gm. (The Musk Ox of America.) The horns approximated and similarly directed, but meeting on the forehead in a straight line; those of the female are smaller and more widely separated; the forehead is convex, and the end of the muzzle furnished with hairs.

ORDER IX.

CETACEA.

The Cetacea are mammiferous animals without hind feet; their trunk is continued by a thick tail, terminating in an horizontal cartilaginous fin, and their head is united to the trunk by a neck, so thick and short, that no diminution of its diameter can be perceived, and composed of very slender cervical vertebræ, which are partly anchylosed or soldered together. The first bones of the anterior extremities are shortened, and the succeeding ones flattened and enveloped in a tendinous membrane, which reduces them to true fins. Their external form is altogether that of fishes, the tail fin excepted, which in the latter is vertical. They always therefore remain in the water; but as they respire by lungs, they are compelled to return frequently to its surface to take in fresh supplies of air. Independently of this, their warm blood, their ears with external though small openings, their vivaparous production, the mammæ with which they suckle their young, and all the details of their anatomy sufficiently distinguish them from fishes.

To the genera of the Cetacea hitherto admitted, we add others formerly confounded with the Morses.

FAMILY I.

CETACEA HERBIVORA.

The teeth of Herbivorous Cetacea have flat crowns; this determines their mode of life, and the latter induces them to leave the water frequently, to seek for pasture on shore. They have two mammæ on the breast, and hairy mustachios; two circumstances which, when observed from a distance, as they raise the anterior part of the body vertically from the water, may give them some resemblance to human beings, and have probably occasioned those fabulous accounts of Tritons and Sirens which some travellers pretend to have seen.

Manatus, *Cuvier*.

The *Lamantins*, or rather the *Manati*, have an oblong body, terminated by an elongated oval fin; the grinders, eight in number throughout, have a square crown, marked with two transverse elevations. Vestiges of nails are discoverable on the edges of their fins, which they employ with tolerable dexterity in carrying their young, and in creeping; hence the comparison of these organs with hands, and the name of *Manatus* applied to the animal, of which *Lamantin* is a corruption. From their manner of living, they are also called *sea cows, mermaids, &c.*

They are found near the mouths of rivers in the hottest parts of the Atlantic Ocean, and it appears that those of the American rivers are specifically different from those of Africa. They grow to the length of fifteen feet. Their flesh is used as food.

Halicore, *Illiger* *.

Grinders composed of two cones laterally united; the teeth implanted in the incisive bone are permanent, and increase to such an extent as to become true pointed tusks, but covered by thick fleshy lips, bristled with mustachios. The body is elongated, and the tail terminated by a crescent-shaped fin. One species only is known, the

Hal. dugong; Siren; Sea Cow, &c. (The Dugong.) It inhabits the Indian Ocean, and is frequently confounded by travellers with the Manatus.

Stellerus, *Cuvier*.

The *Stelleri* appear to have but a single compound grinder on each side, with a flat crown, and bristled with plates of enamel. Their fins have not even the little nails observed on those of the Manatus. According to Steller, the first, and hitherto the only one who has described them, their stomach also is much more simple.

One species only is known, which is confined to the north part of the Pacific Ocean.

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* *Halicore*, Maid of the Sea.

FAMILY II.

CETACEA ORDINARIA.

The *Ordinary Cetacea* are distinguished from the preceding by the singular apparatus from which they have received the name of *Blowers*. As a large quantity of water passes into their huge mouths along with their prey, some way was necessary by which they could get rid of it; accordingly, it passes through the nostrils by means of a peculiar disposition of the velum palati, and is accumulated in a sac situated at the external orifice of the cavity of the nose, whence, by the compression of powerful muscles, it is violently expelled through a narrow opening on the top of the head. It is in this way they produce those jets d'eau observed by navigators at so great a distance.



Their nostrils, continually bathed in salt water, could not be lined with a membrane sufficiently delicate to enable them to detect odours, and accordingly they have none of those projecting laminæ found in the nasal cavities of other animals; the olfactory nerve is deficient in several; and if there be any which enjoy the sense of smell, it must be in a very slight degree. Their larynx, of a pyramidal form, penetrates into the posterior nares to receive air and conduct it to the lungs, without compelling the animal to raise its head and throat above the water for that purpose: there are no salient laminæ in the glottis, and the voice is reduced to a simple lowing. They have no vestige of hairs; but their whole body is covered with a smooth skin, under which is that thick layer of blubber abounding in oil, the principal object for which they are pursued.

The stomach is divided into five and sometimes into seven distinct sacs; instead of one single spleen, they have several, small and globular; those which are possessed of teeth, have them all conical and alike; they do not chew their food, but swallow it rapidly.

Two small bones, suspended in the flesh, are the only vestiges of posterior extremities.

Several have a vertical fin on the back, composed of a tendinous substance, but unsupported by bone. Their eyes, flattened in front, have a thick and solid sclerotica; the teguments of the tongue are soft and smooth.

They may be again divided into two small tribes: those in which the head bears the usual proportion to the body, and those in which it is immoderately large. The first comprehends the Dolphins and the Narwhals.

DELPHINUS, *Linnæus.*

The *Dolphins* have teeth in both jaws, all simple, and almost always conical. They are the most carnivorous, and, in proportion to their size, the most cruel of their order.

DELPHINUS, *Cuvier.*

The Dolphins, properly so called, have a convex forehead, and the muzzle forming a kind of rostrum, or snout, in front of the head, more slender than the rest.

PHOCÆNA, *Cuvier.*

The *Porpoise** has no rostrum, but a short and uniformly convex muzzle.

Monodon, *Linnæus.*

The *Narwhals* have no teeth, properly speaking, but mere long, straight and pointed tusks, implanted in the intermaxillary bone, and directed in the line of the axis of the body. The form of their body and that of their head greatly resemble that of the porpoises. One species only is well known, the



M. monoceros, Lin. (The Narwhal.) The tusk of this animal, which is spirally furrowed and sometimes ten feet in length, was for a long time called the horn of the unicorn. It has, it is true, the germs of two tusks, but it is very seldom that both become equally developed. That of the left side usually attains its full growth, while the other always remains hidden in its alveolus.

The other cetacea have the head so large as to constitute one third or one half of the length of the whole body; but neither the cranium nor the brain participates in this disproportion, which is altogether owing to an enormous development of the bones of the face.

PHYSETER, *Linnæus.*

The *Cachalots* † are Cetacea with a very voluminous head, excessively enlarged, particularly in front, in whose upper jaw there is neither whalebone nor tooth, or if any, very small, and not projecting; the lower jaw, narrow, elongated, and corresponding to a furrow in the upper one, is armed on each side with a range of cylindrical or conical teeth, which, when the mouth is closed, enter into corresponding cavities in the upper jaw. The superior portion of their enormous head consists almost entirely of large cavities, separated and covered by cartilages, and filled with an oil which becomes fixed as it cools, well known in commerce by the name of *spermaceti,* a substance for which they are principally sought; the body not having much fat, and consequently yielding but little oil. These cavities, however, are very distinct from the true cranium, which is rather small, is placed under their posterior portion, and contains the brain as usual.

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* Porpoises from *porcus piscis,* hog-fish.

† *Physeter,* as well as *physalus,* signifies *blower. Cachalot* is the name used by the Biscayans; from *cachau,* which in the Cantabrian dialect means *tooth.*

The odorous substance, named *ambergris*, appears to be a concretion formed in the intestines of the Cachalot, particularly during certain states of disease.

The species of the Cachalots are far from being well ascertained.

Balæna, *Linnæus.*

The *Whales* are equal in size to the cachalots, and in the proportional magnitude of the head, although the latter is not so much enlarged in front; but they have no teeth. The two sides of their upper jaw, which is keel-shaped, or furnished with thin, compact, transverse laminæ, called whalebone, formed of a kind of fibrous horn, fringed at the edges, which serve to retain the little animals on which these enormous cetacea feed. Their lower jaw, supported by two osseous branches arched externally and towards the summit, and completely unarmed, lodges a very thick and fleshy tongue; and when the mouth is closed, envelopes the internal part of the upper jaw, and the whalebone with which it is invested. These organs do not allow whales to feed on such large animals as their size might induce us to imagine. They live on fish, but principally on worms, mollusca, and zoophytes, selecting, it is said, the very smallest, which become entangled in the filaments of the whalebone.



Bal. mysticetus, Lin. (The Common Whale). Has long been considered the largest of all animals; but from the late observations of Captain Scoresby, it appears that it scarcely ever exceeds seventy feet, a length frequently surpassed by the wrinkle-bellied whales. It has no dorsal fin. To procure its fat or blubber, which is sometimes several feet in thickness, and contains immense quantities of oil, whole fleets are annually equipped. Formerly sufficiently bold to venture into our seas, it has gradually retired to the extreme north, where the number is daily diminishing. Besides oil, it produces black and flexible whalebone, eight or ten feet in length, each individual having from eight to nine hundred strips on each side of the palate. One hundred and twenty tuns of oil are obtained from a single whale. Shell-fish attach themselves to its skin, and multiply there as on a rock, and some of the Balanus family even penetrate into it.

OF THE OVIPAROUS VERTEBRATA.

Although the three classes of the Oviparous Vertebrata differ greatly from each other in their quantum of respiration, and in all that relates to it, viz. the power of motion and the energy of the senses, they present several common characters when opposed to the Mammalia, or Viviparous Vertebrata.

Oviparous production consists, essentially, in this—the young animal is not attached to the parietes of the oviduct, but remains separated from it by its most external envelope. Its aliment is prepared beforehand, and enclosed in

a sac attached to its intestinal canal; this is what is called the vitellus, or yolk of the egg, to which the young animal is a sort of appendage, at first imperceptible, but which is nourished and augmented by absorbing the fluid of that yolk. Such of the Ovipara as breathe with lungs have the egg furnished with a highly vascular membrane, which appears to serve for the purposes of respiration; it is connected with the bladder, and is analogous to the allantoid of the Mammalia. It is neither found in Fishes nor in the Batrachians which latter, when young, respire, like Fishes, by bronchiæ.

CLASS II.

AVES.

Birds are Oviparous Vertebrata, with a double system of circulation and respiration, organised for flight.

Their lungs, undivided and attached to the ribs, are enveloped by a membrane pierced with large holes, which allow the air to pass into several cavities of the chest, lower part of the abdomen, arm pits, and even of the interior of the bones, so that not only is the surface of the pulmonary vessels bathed in the ambient fluid, but that also of an infinitude of vessels in other parts of the body. Thus, in certain respects, birds respire by the branches of the aorta, as well as by those of the pulmonary artery, and the energy of their irritability is in proportion to their quantity of respiration*. The whole body is so constructed as to profit by this energy.

Their anterior extremities, destined to sustain them in flight, could neither serve them for standing, nor for prehension; they are bipeds then, and pick up objects from the earth with their mouth; their body, consequently, is inclined before their legs, the thighs directed forwards, and the toes elongated, to form a sufficient base for it. The pelvis is very much extended in length, in order to furnish points of attachment to those muscles which support the trunk upon the thighs. There is even a suite of muscles reaching from the pelvis to the toes, passing over the knee and heel, so that the simple weight of the bird flexes the toes; it is thus that some species are enabled to sleep in security, while perched on one foot.

The neck and the beak are elongated so as to reach the ground, but the former has the requisite flexibility for bending backwards when at rest,—consequently, it has many vertebræ. The trunk, on the con-

* Two common swallows consumed as much pure air as a Guinea Pig.

trary, which serves as a fulcrum to the wings, has but little mobility; the sternum, particularly, to which are attached the muscles which lower the wings in flight, is of great extent, and has its surface still more enlarged by a salient process in its middle. It is originally composed of five pieces. The greater or less degree of the ossification of the notches, and the extent of the interval they leave between them and the principal bone, denote a relative strength of wing and power of flight. The diurnal birds of prey, the swallows, and the humming-birds, lose, as they grow old, all traces of these unossified spaces.

The *fourchette* produced by the junction of the two clavicles, and the two powerful stretches formed by the coracoid apophysis, keep the shoulders apart, notwithstanding the efforts requisite for flight, that act in an opposite direction; the greater the power of flight, the more open and strong is the fourchette. The wing, supported by the humerus, fore-arm, and hand, the latter of which is elongated, and has one finger and vestiges of two others, is furnished throughout its length with a range of elastic quills, which greatly extends the surface that resists the air. Those which belong to the air are termed *primaries*, and there are always ten; those attached to the fore-arm are called *secondaries*; but their number varies; weaker feathers appended to the humerus are called *scapulars;* the bone, which is analogous to the thumb, is also furnished with what are termed *spurious quills*. Along the base of the quills is a range of feathers named *coverts*.

The bony tail is very short, but has a range of large quills, which, when spread out, assist in supporting the bird; they are generally twelve in number, sometimes fourteen, and in the gallinaceæ eighteen.

The legs have a femur, a tibia and a fibula, which are connected with the femur by an articulation with a spring, which keeps up the extension without any effort on the part of the muscles. The tarsus and metatarsus are represented by one single bone, terminating in three pulleys.

Most commonly there are three toes before, and a thumb behind; the latter being sometimes deficient. In the martins, it is directed forwards. In the climbers, on the contrary, the external toe and the thumb are directed backwards. The number of articulations increases in each toe, commencing with the thumb, which has two, and ending with the external toe, which has five.

Birds are generally covered with feathers, the kind of tegument best adapted for defending them from the rapid variations of temperature to which their movements expose them. The air cavities which occupy the interior of their body, and even supersede the marrow in the bones, increase their specific lightness. The sternal, as well as the vertebral

portion of the ribs is ossified, in order to give more power to the dilatation of the chest. To each rib is annexed a small bone, which soon becomes soldered to it, and is directed obliquely towards the next one, thereby giving additional solidity to the thorax.

The eye is so constructed, in birds, as to distinguish, with equal facility, objects at a distance, or in its immediate vicinity; a vascular and plaited membrane, which stretches from the bottom of the globe to the edge of the crystalline, probably assists in effecting this, by displacing that lens. The anterior surface of the ball is also strengthened by a circle of bony pieces; and besides the two ordinary eye-lids, there is always a third one placed at the internal angle, which, by a remarkable muscular apparatus, can be drawn over the eye like a curtain.

The breadth of the bony openings of the nostrils determines the strength of the beak; and the cartilages, membranes, and other teguments which narrow down those apertures, influence the power of smell, and the nature of the food.

There is but little muscular substance in the tongue, which is supported by a bone articulated with the hyoid; in most birds this organ is not very delicate.

The feathers, as well as the quills, which only differ in size, are composed of a stem, hollow at base, and of laminæ, which are themselves furnished with smaller ones; their tissue, lustre, strength, and general form vary infinitely. The touch must be feeble in all such parts as are covered with them; as the beak is almost always horny, and has but little sensibility, and the toes are invested with scales above, and a callous skin underneath, so that sense can have but little activity in this class of animals.

Birds moult twice a year. In certain species, the winter plumage differs in its colours from that of summer; in the greater number, the female differs from the male having less vividness of tint; and when this is the case, the young of both sexes resemble the former. When the adult male and female are of the same colour, the young ones have a livery peculiar to them.

The brain of birds has the same general characters as that of other Oviparous Vertebrata, but is distinguished by its very great proportionate size, which often surpasses the proportion of this organ in the Mammalia.

The rings of the trachea are entire; there is a glottis at its bifurcation most commonly furnished with peculiar muscles, which is called the *inferior larynx*; this is the spot where the voice of birds is produced; the immense volume of air contained in the air sacs contributes to its strength, and the trachea, by its various forms and motions, to its

modifications. The superior larynx, which is extremely simple, has but little to do with it.

The horny substance which invests the two mandibles performs the office of teeth, and is sometimes so jagged as to resemble them ; its form, as well as that of the mandibles which support it, varies extremely, and according to the kind of food used by each species.

The digestion of birds is in proportion to the activity of their life, and the force of their respiration. The stomach is composed of three parts: the crop, which is an enlargement of the œsophagus ; a membranous stomach, in the thickness of whose parietes are a multitude of glands whose juices moisten the aliment ; and finally, the gizzard, armed with two powerful muscles, united by two radiated tendons, and lined internally with a kind of cartilaginous velvet. The food is the more easily ground there, as birds constantly swallow small stones, in order to increase its triturative power.

In the greater part of the species which feed exclusively on flesh or fish, the muscles and villous coat of the gizzard are greatly attenuated ; and it seems to make but a single sac with the membranous stomach.

The dilatation of the crop is also sometimes wanting.

The egg, detached from the ovary, where it consists merely of yolk, imbibes that external fluid, called the white, in the upper part of the oviduct, and becomes invested with its shell at the bottom of the same canal. The chick contained within it is developed by incubation, unless the heat of the climate suffices for that purpose, as is the case with the egg of the ostrich. The young bird has a little horny point at the extremity of the beak, with which it splits open the shell, and which falls off a few days after it is hatched.

The industry and skill exhibited by birds in their variously constructed nests, and their tenderness and care in protecting their eggs and young, are known to every one ; it is the principal part of their instinct. Their rapid transitions through different regions of the air, and the vivid and continual action of that element upon them, enable them to anticipate atmospheric changes, to an extent of which we can form no idea ; and caused the ancients, in their superstition, to attribute to them the power of prescience or divination. It is unquestionably on this faculty, that depends the instinct which acts upon the birds of passage, prompting them to seek the south on the approach of winter, and the north on the return of spring. They have memory, and even imagination—for they dream. They are easily tamed, may be taught to render various services, and retain the air and words of songs.

Division of the Class of Birds into Orders.

Their distribution is founded, like that of the Mammalia, on the organs of manducation or the beak, and on those of prehension, that is on the beak, and particularly on the feet.

The first that arrest our attention are the *palmated feet*, or those in which the toes are connected by membranes, which distinguish all *swimming birds*. The position of these feet behind; the length of the sternum; the neck, often longer than the legs to enable it to reach the ground; the dense, polished plumage, impermeable to water, all concur with the feet in making good navigators of the Palmipedes.

In other birds, which most commonly are partially web-footed, at least between the external toes, we observe elevated tarsi; legs divested of feathers at their lower extremities; a long thin shape; and, in fine all the requisites for wading along the shores of rivers to seek their food. Such, in fact, is the regimen of the great number; and although some of them inhabit dry grounds, they are called *shore birds*, or *waders*.

Among the true land birds, the *gallinaceæ*, like our domestic cock, have a heavy carriage, a moderate beak, the upper mandible of which is arched; the nostrils partly covered by a soft and inflated scale; the toes almost always indented on the edges, and short membranes between the bases of the anterior ones. They fly heavily, and but a short distance at a time. Their chief food is grain.

Birds of prey have a hooked beak, the point of which is sharp, and curved downwards; the nostrils pierced in a membrane which invests the whole base of that beak, and feet armed with vigorous talons. They live on flesh, pursue other birds, and are consequently, for the most part, vigorous in flight. The great number have still a slight web between the external toes.

The *Passerinæ* comprises many more species than all the other families; but their organisation presents so many analogies that they cannot be separated, although varying greatly in size and strength. Their two external toes are united at the base, and sometimes for a part of their length.

Finally, the name of *Scansoriæ*, or climbing birds, has been given to those whose external toe, like the thumb, is directed backwards, because the greater number profit by a conformation, so favourable to a vertical position, to climb trees.

Each of these orders is subdivided into families and genera, and principally from the conformation of the beak.

ORDER I.

ACCIPITRES, *Linnæus.*

Birds of prey are known by their hooked beak and talons, powerful weapons, with which they pursue other birds, and even the weaker quadrupeds and reptiles. They are among birds what the carnivora are among quadrupeds. The muscles of their thighs and legs indicate the strength of their claws; their tarsi are rarely elongated; they have, all, four toes; the nail of the thumb and that of the internal toe are the strongest.

They form two families, the diurnal and the nocturnal.

FAMILY I.

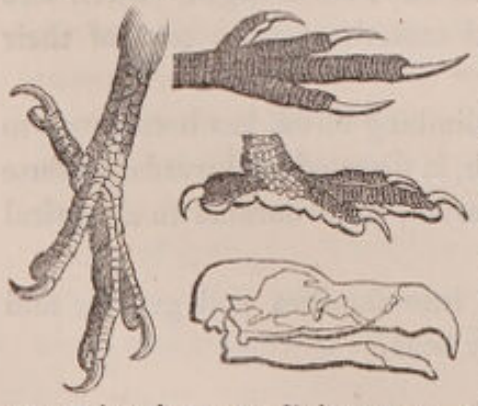
DIURNÆ.



The eyes of the diurnal birds of prey are directed side-ways; they have a membrane called the *cera*, or *eere*, covering the base of the beak, in which the nostrils are pierced; three toes before, one behind, without feathers, the two external ones almost always united at the base by a short membrane; the plumage dense, the quills strong, and great power on the wing. Their sternum is broad, and completely ossified, in order to give more extended attachments to the muscles of the wings, and their fourchette semicircular and widely separated, the better to resist the violent flexions of the humeri necessary to a rapid flight.

Linnæus comprehended them all under two genera, which are so many natural divisions, the *vultures* and the *falcons*.

Vultur, *Linnæus.*



The *vultures* have eyes flush with the head, and reticulated tarsi, that is, covered with small scales; an elongated beak, curved only at the end, and a greater or less portion of the head, or even of the neck divested of feathers. The strength of their talons does not correspond with their size, and they make more use of their beak than of their claws. Their wings are so long that in walking they keep them in a state of semi-extension. They are a cowardly genus, feeding oftener on carrion than on a living prey; when they have fed, their crop forms a great

protuberance above the fourchette, a fetid humour flows from their nostrils, and they are almost reduced to a state of stupid insensibility.

Vult. gryphus, Lin. (The Condor.) Blackish; a great part of the wing ash coloured; collar, silky and white; the male, in addition to his superior caruncle, which is large and entire, has another under the beak, like the cock. This species has been rendered famous by exaggerated reports of its size; it is, however, but a little larger than the *læmmer-geyer*, to which it assimilates in habits. It is found in the most elevated mountains of the Andes, in South America, and flies higher than any other bird.

The genus Vultur is now divided into *vultur proper*, *cathartes* (our Turkey buzzard), *percnopterus* (the Urubu or carrion crow of the south), and *gypactos*, to which last belongs the læmmer-geyer, the largest bird of prey in the eastern continent.

Falco, *Linnæus.*

The *falcons* form the second, and by far most numerous division of the diurnal birds of prey. Their head and neck are covered with feathers; their eyebrows project, which occasions the eye to appear sunk, and gives to their physiognomy a character very different from that of the vultures: the greater number prey on living animals, but they differ in the courage with which they pursue it. Their first plumage is often very differently coloured from that of the adult, which is only assumed in their third or fourth year, a circumstance which has occasioned a great multiplication of species. The female is generally one third larger than the male, which, on this account, is styled a *tarsel* or *tercel*. We should, first of all, subdivide this genus into two great sections.



NOBLE BIRDS OF PREY.

Falcons, properly so called.

The *true falcons* constitute the first, and, in proportion to their size, are the most courageous; a quality which is derived from the power of their arms and wings; their beak, curved from its base, has a sharp tooth on each side of its point, and the second quill of their wings is the longest, the first nearly equalling it, which renders the whole wing longer and more pointed. From this, also, result peculiar habits: the length of the quills of their wings diminishes their vertical power, and compels them, in a calm state of the atmosphere, to fly obliquely forwards, so that when they wish to rise directly upwards, they are obliged to fly against the wind.

F. communis, Gm. (The Common Falcon.) As large as a hen, and distinguished by a triangular, black moustache on the cheek, larger than that of any other species of the genus; it varies as to colours according to its age.

It is this celebrated species which has given its name to that kind of hunting in which birds of prey are used. It inhabits the whole of the northern regions, and builds in the most elevated and inaccessible cliffs.

HIEROFALCO, *Cuvier**.

The *gerfalcons* have wing quills similar to those of the other noble birds, which they perfectly resemble in disposition; but their beak has only an emargination like that of the ignoble ones. Only one species is well known.



F. candicans. (The Gerfalcon.) One fourth larger than the falcon, and the most highly esteemed by falconers. It is chiefly obtained from the north; its usual plumage is brown above, with an edging of paler points on each feather, and transverse lines on the coverts and quills.

The second section of the great genus *Falco* is that of the

IGNOBLE BIRDS OF PREY.

So called, because they cannot be easily employed in falconry; a tribe much more numerous than that of the nobles, and which it is also necessary to subdivide considerably. The fourth quill of their wings is almost always the longest, and the first is very short which produces the same effect as if their wing were obliquely truncated at the tip, whence, cæteris paribus, result diminished powers of flight; their beak also is not so well armed, there being no lateral tooth near its point, but a mere slight emargination about the middle of its length.



AQUILA, *Brisson.*

The *Eagles* which constitute the first tribe, have a very strong beak, straight at base, and only curved towards the point. Among them we find the largest species of the genus, and the most powerful of all the birds of prey.

The Eagles are now subdivided into *Aquila proper* (to which belongs the Ring-tailed Eagle), the *Haliætus* of Savigny, or *Fisher Eagles* of Cuvier (the Pygargus and Bald Eagle), *Pandion* (the Osprey), *Circætus Harpyia*, (where we find the "Great Harpy of America," that possesses such strength of beak as to be able to cleave a man's skull), and *Morphnus*, differing in certain peculiarities of the tarsi, claws, and wings.

ASTUR, *Bechstein.*

The *Goshawks*, which form the second division of the Ignobles, like the last three tribes of Eagles, have wings shorter than their tail; but their beak is curved from its base, as in all those which are to follow. We particularly designate as GOSHAWKS those which have rather short and scutellated tarsi.

The name of SPARROWHAWK (NISUS, Cuv.) is generally appropriated to

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* *Hierax, Hiero-falco, Sacred Falcon*, &c. names connected with the superstitions of the Egyptians respecting certain birds of prey. *Gerfalcon* is a corruption of *Hierofalco.*

those whose tarsi are higher and scutellated; but the transitions from one division to the other are almost insensible.

F. nisus, Lin. (The Common Sparrowhawk.) Coloured like the Goshawk, but its legs are longer, and it is a third less in size. It is employed, however, by falconers.

MILVUS, *Bechstein.*

The *Kites* have short tarsi, and weak toes and nails, which, added to a beak equally disproportioned to their size, render them the most cowardly species of the whole genus; they are distinguished by their excessively long wings, and their forked tail, which give them great powers of flight.

F. furcatus, Lin. (The Fork-tailed Kite.) White; wings and tail black; the two external quills of the latter very long; larger than the preceding. It attacks reptiles.

PERNIS, *Cuvier.*

The *Honey-Buzzards*, with the weak beak of the Kites, have a very peculiar character in the space between the eye and the beak, which, in all the rest of the genus Falco, is naked, and simply furnished with a few hairs, but in these it is covered with a dense plumage, the feathers of which are cut like scales, their tarsi are half feathered above and reticulated: their tail is equal, wings long, and their beak curved from its base like all those which follow.

BUTEO, *Bechstein.*

The *Buzzards* have long wings; the tail equal; the beak curved from its base; the space between it and the eyes naked; the feet strong.

CIRCUS, *Bechstein.*

The *Harriers* differ from the Buzzards in their elevated tarsi, and in a kind of collar on each side of their neck, formed by the tips of the feathers which cover their ears. Finally, the

SERPENTARIUS, *Cuvier.*

The *Snake-Eater* or *Secretary*, is an African bird of prey, whose tarsi are at least double the length of those of the preceding ones, which caused some naturalists to place it among the Grallatoriæ, or Waders; but its legs, completely invested with feathers, its hooked and cleft beak, projecting eye-lids, and all its anatomical details place it in the present order. It inhabits the dry and open grounds in the vicinity of the Cape, where it hunts reptiles on foot; its claws consequently become much worn. Its chief strength lies in the leg.

FAMILY II.

NOCTURNÆ.

Nocturnal birds of prey have a large head; great eyes, directed forwards,





surrounded by a circle of slender feathers, the anterior of which cover the cera of the beak, and the posterior the opening of the ear. Their enormous pupil permits the entrance of so many rays of light, that they are dazzled by that of day. Their cranium, which is thick, but formed of a light substance, is excavated by large sinuses, which communicate with the ear, and which probably assist in strengthening the sense of hearing; but the organs of flight are not very vigorous; their fourchette is weak; their feathers being soft, and covered with a fine down, make no noise in flying. They can direct their external toe either forwards or backwards. These birds are chiefly on the wing during twilight, and when the moon shines. When attacked in the day time, they do not fly off, but stand more erect, assume odd postures, and make the most ludicrous gestures.

Their prey is wholly animal, consisting of mice, small birds, and insects. Small birds have a natural antipathy to them, and frequently assemble from all quarters to attack them. They form but one genus,

Strix, *Linnæus.*

The *Owls* may be divided by their tufts, the size of their ears, the extent of the circle of feathers which surrounds their eyes, and some other characters.

Otus, *Cuvier.*

The *Horned Owls*, or those which have two tufts of feathers on the forehead (vulg. *horns*), which they can erect at pleasure; the conch of their ear extends in a semicircle from the beak to the top of the head, and is furnished in front with a membraneous operculum. Their feet are feathered down to the nails. Such is

Str. Otus, Lin. (The Common Owl.) Fawn-coloured, with longitudinal brown spots on the body and underneath; wings and back vermiculated with brown; horns half the length of the head; eight or nine bands on the tail.

The genus Strix, as already stated, now forms several subgenera, such as *Otus, Syrnium, Bubo, Scops*, and *Noctua*. To the last belongs the

Str. nyctea, Lin. (The Snowy Owl.) This bird almost equals the Grand Duc in size. Its snow-white plumage is marked with transverse brown spots, which disappear with age. It inhabits the north of both continents, builds upon high rocks, and pursues hares, grouse, &c.

ORDER II.

PASSERINÆ*.

This order is the most numerous of the whole class.

The birds which compose it have neither the violence of the birds of prey, nor the fixed regimen of the Gallinaceæ, nor of the water-birds; insects, fruit, and grain constitute their food, which consists the more exclusively of grain, in proportion to the largeness of their beak, and of insects, as it is the more slender. Those which have strong beaks pursue even small birds. Among them we find the singing birds, and the most complicated inferior larynx.

The proportional length of their wings, and their power of flight, are as various as their habits.

Our first division is founded upon the feet; we then have recourse to the beak.

The first and most numerous comprehends those genera in which the external toe is united to its fellow by one or two phalanges only.

FAMILY I.

DENTIROSTRES.

In this family the beak is emarginate on the sides of the point. It is in this family that we find the greatest number of insectivorous birds, though almost all of them likewise feed on berries and other soft fruits. The genus is determined by the general form of the beak, which is strong and compressed in the shrikes and thrushes, depressed in the fly-catchers, large and round in the tanagers. The external claw is united to the internal one by one and sometimes two phalanges, as represented in the engraving. This family is divided into eighteen genera, but the change from one distinction to the other is so gradual, that it is an extreme difficult matter to fix the limits of the various genera.





LANIUS, *Linnæus.*

In the *shrikes* the beak is conical or compressed, and more or less hooked at the point; they live in families, and fly irregularly and precipitately, uttering shrill cries; they build on trees, lay five or six eggs, and take great care of their young. They have a habit of imitating, on the spot, a part of the songs of such birds as live in their vicinity. The upper part of the females and of the young is marked with fine transverse lines.



* Passerine; from *Passer*, a sparrow.

Lan. collurio, Gm. M. Vieillot has formed his genus Lanius (The Butcher Bird). Top of the head and rump ash-coloured; back and wings fawn-coloured; whitish above; a black band over the eye; wing-quills black edged with fawn colour, those of the tail black, the lateral ones white at base. It destroys small birds, young frogs, and great numbers of insects, which it sticks upon the thorns of bushes, in order to devour them at leisure, or to find them again when wanted.

The subdivisions of this genus are *Vanga*, *Ocypterus*, *Barita*, &c. differing chiefly in the arrangement of the beak.

Muscicapa, *Linnæus.*

The *Fly-Catchers* have a horizontally depressed beak, furnished with hairs at its base, and the point more or less hooked and emarginated. Their general habits are those of the Shrikes, and they live on small birds or insects, according to their size.



The weakest of them gradually approach the form of the wagtails.

This genus is now divided into various subgenera, such as *Tyrannus*, *Muscipeta*, *Muscicapa*, *Gymnocephalus*, &c. The species are very numerous.

Ampelis, *Linnæus.*

The *Crown-Birds* have the depressed beak of the Fly-catchers, but it is somewhat shorter in proportion, tolerably broad and slightly arcuated. They are remarkable for the beauty of their plumage; during the breeding season the male assumes a very bright azure blue; the remainder of the year both sexes have the same tints of brown. Those in which the beak is the most pointed and strong, have still a decidedly insectivorous regimen: they are called Plauhau from their note—the Querula, Vieill. They inhabit America, where they pursue insects in flocks.



They are now distributed into several subgenera, such as *Tersina*, *Ceblepyrus*, *Bombycilla* (the Chatterers), *Procnias*, &c.

Edolius, *Cuvier.*

Belongs also to the great series of the Fly-catchers; the beak is depressed and emarginate at the end; its upper ridge is acute; but what distinguishes it, is, that both mandibles are slightly arcuated throughout their length; the nostrils are covered with feathers, and there are, besides, long hairs forming mustachios.

The species are numerous in the countries bordering on the Indian Ocean. They are generally of a black hue, have a forked tail, and live on insects; some of them, it is said, sing as sweetly as the nightingale.

TANAGRA, *Linnæus.*

The *Tanagers* have a conical beak, triangular at base, slightly arcuated at its ridge, emarginate near the end; wings and flight short. They resemble the finches in habits, and feed on grain as well as on berries and insects. The greater number are remarkable for their bright colours.

TURDUS, *Linnæus.*

The *Thrushes* have a compressed and arcuated beak, but its point is not hooked, and its emarginations do not form such deep notches as in the shrikes; as we have already stated, however, there are gradual transitions from one genus to the other.



Their regimen is more frugivorous, generally feeding on berries. Their habits are solitary. The name thrush is more particularly applied to the song thrush, *turdus musicus*, which is admired by every one for its melodius notes.

T. polyglottus, Lin. (The Mocking-Bird.) From North America; ash-coloured above, paler beneath, with a white band on the wing. It is celebrated for the astonishing facility with which it imitates the notes of other birds, and even all kinds of sounds.

Buffon has very properly separated from the thrushes, the

MYOTHERA, *Illiger.*

The *Ant-catchers* are known by their long legs and short tail. They live on insects, and chiefly on ants. They are found in both continents.

M. rex. (King of the Ant-Catchers.) The largest of all, and stands the highest; its tail, on the other hand, is the shortest, and at the first glance it might be taken for a wader; it is about the size of a quail, and its grey plumage is agreeably chequered. It is more solitary than the others.

We must also separate from the thrushes:

CINCLUS, *Bechstein*,

Or the *water-thrushes*, which have a compressed, straight beak, with mandibles of an equal height, nearly linear, and becoming sharp near the point; the upper one hardly arcuated.

Africa, and the countries bordering on the Indian Ocean, produce a genus of birds, neighbours of the thrushes, whieh I call

PHILEDON.

Their beak is compressed, slightly arcuated throughout its length, and emarginate near the point; nostrils large, and covered by a cartilaginous scale; their tongue terminated by a pencil of hairs.

EULABES, *Cuvier.*

The birds of this genus are closely allied to those of the preceding one. Their beak is nearly that of a thrush; their nostrils are round and smooth. Their distinguishing mark consists in broad strips of naked skin on each side of the occiput, and a bald spot on the cheek.

GRACULA, *Cuvier,*

Is another genus allied to the thrushes. The species inhabit Africa and the countries bordering on the Indian Ocean. Their beak is compressed, very little arcuated, and slightly emarginate; its commissure forms an angle like that of the starling. They have the habits of starlings, and like them, pursue insects in flocks.

PYRRHOCORAX, *Cuvier.*

Have the compressed, arcuated, and sloped beak of the thrushes; but their nostrils are covered with feathers, as in the crows, to which they were for a long time united. There is one in Europe.

I can find no character sufficient to warrant removing from the thrushes

ORIOLUS, *Linnæus,*

Or the *orioles,* whose beak, similar to that of the thrushes, is merely a little stronger; the feet a little shorter, and the wings a little longer in proportion.

GYMNOPS, *Cuvier.*

The same strong beak as the orioles; the nostrils round, without scales or surrounding membrane; a great part of the head naked.

Some of them have prominences on the beak. In these the tongue is pencillated as in Philedon.

MÆNURA, *Shaw.*

These birds evidently belong to the order of the Passerinæ, and approach the thrushes in their beak, which is triangular at base, elongated, slightly compressed, and emarginate near the point. They are distinguished by the great tail of the male, which is very remarkable for the three sorts of feathers which compose it, viz. the twelve common ones with very fine and widely separated barbs; two more in the middle only one side of which is furnished with thickly set barbs, and two external ones curved into the figure of an S, or like the arms of a lyre, whose internal barbs, large and thickly set, form a kind of broad riband, while those that are external are very short, becoming longer only near the tip. The female has only twelve ordinary quills.

The singular species, *Mænura lyra,* inhabits the rocky districts of New Holland; its size is somewhat less than that of the pheasant.

Motacilla, *Linnæus.*

The *warblers* form an excessively numerous family, known by the beak, which is straight, slender, and similar to a bodkin. When slightly depressed at base, it approaches that of the fly-catchers; when compressed, and its point is curved a little, it leads to the straight beaked shrikes.



Curruca, *Bechstein.*

A straight beak, slender throughout, slightly compressed before; the upper mandible a little curved near the point. The most celebrated of this subgenus is

Mot. luscinia, Lin. (The Nightingale.) A reddish brown above; whitish grey beneath; the tail somewhat redder. Every one knows this songster of the night, and the varied melody with which it fills the woods. It builds on trees, and does not begin to sing until the young ones are hatched. The male, then, as well as the female, is occupied in providing them with food.

The other subgenera are *Saxicola* (the Wheat-ear); *Sylvia* (the Blue-Bird); *Regulus*; *Troglodytes* (Wrens;) *Motacilla* (the Wag-tails); *Anthus* (Meadow Larks).

We will terminate the family of the Dentirostres with some birds distinguished from all preceding ones by their two external toes, which are united at the base for about a third of their length, a circumstance which approximates them to the family of the Syndactyli.

Pipra, *Linnæus.*

The *manakins* have a compressed beak, higher than it is broad, and emarginated; large nasal fossæ. Their feet and tail are short; the general proportions of their form have long caused them to be considered as very similar to the titmouse. At their head, but in a separate group, should be placed



Rupicola, *Brisson.*

The *rock manakins* or *cocks of the rock*, which are large birds, and have a double vertical crest on the head, formed of feathers arranged like a fan The adult males of the two American species, *Pipra rupicola*, and *Pip. Peruviana*, are of a most splendid orange colour; the young of an obscure brown. They live on fruit, scratch the ground like the common hen, and construct their nests with pieces of dry wood, in the depths of rocky caverns. The female lays two eggs.

Eurylaimus, *Horsfield.*

Toes similar to those of the manakins and the rock manakins; but the beak, as strong as that of the tyrants, is enormously broad and depressed, the base

even surpassing the width of the forehead. The point is a little hooked, and slightly emarginate on each side; the ridge is blunt.

These birds inhabit the archipelago of India. The ground of their plumage is black, variegated with patches of bright colours, and they have something of the air of the bucco, a genus of a very different order. They live near water, and feed on insects.

FAMILY II.

FISSIROSTRES.

The Fissirostres form a family numerically small, but very distinct from all others in the beak, which is short, broad, horizontally flattened, slightly hooked, unemarginate, and with an extended commissure, so that the opening of the mouth is very large, which enables them to swallow with ease the insects they capture while on the wing.

They are most nearly allied to the fly-catchers, and to the procniæ in particular, whose beak only differs from theirs in being emarginate.

They are separated, like the birds of prey, into two divisions, the Diurnal and the Noeturnal. The genus

Hirundo, *Linnæus*,

Or the *swallows*, comprehends the diurnal species, all of which are remarkable for their dense plumage, extreme length of wing, and velocity of flight. Among them we distinguish

Cypcelus, *Illiger*.

Of all birds, these have the longest wings in proportion to their size, and the greatest powers of flight. Their tail is forked; their extremely short feet have this very peculiar character: the thumb is directed forward almost as much as the other toes, and the middle and external ones consist each of three phalanges like the internal one. The shortness of their feet, together with the length of their wings, prevents them, when on the ground, from rising, and consequently they pass great part of their lives, if I may so express it, in the air, pursuing, in flocks and with loud cries, their insect prey through the highest regions of the atmosphere. They nestle in holes of walls, or fissures in rocks, and climb along the smoothest surfaces with great rapidity.

Hirundo, *Cuvier*.

The *Swallows proper* have the toes and sternum disposed like those of the Passerinæ generally. In some of them the feet are invested with feathers down to the nails; the thumb still exhibits a disposition to incline forward; the tail is forked, and of a moderate size.

There are some in which the tail is nearly square. Others have naked toes,

CAPRIMULGUS, *Linnæus**.

The *Goatsuckers* have the same light, soft plumage, shaded with grey and brown, that characterises the nocturnal birds. Their eyes are large; the commissure of the beak extending still higher up than that of the swallow, and furnished with stiff mustachios, is capable of engulfing the largest insects, which are retained there by a glutinous saliva; the nostrils, formed like small tubes, are at its base. Their wings are long; their feet short, with feathered tarsi, and their toes united at base by a short membrane†. Goatsuckers live solitarily, and never venture abroad, except at twilight, and in the night during fine weather. They hunt Phalanæ and other nocturnal insects, and lay a small number of eggs on the bare ground, without taking any pains in the construction of a nest. The rushing of the air into their immense mouth, while on the wing, produces a very peculiar humming sound.



America produces several of these birds with a round or square tail, one of which, *C. vociferus* (The Whip-Poor-Will), is celebrated on account of its loud and peculiar cries in the spring of the year. One of them also is found in New Holland, and several are found in Africa, some of which have a pointed tail, and others a forked one, indicating some affinity between this genus and the swallows; the middle claw of the species with forked tails are without the toothed claws.

FAMILY III.

CONIROSTRES.

The Conirostres comprehend genera with a strong beak, more or less conical, and unemarginate; the stronger and thicker their beak, the more exclusively is grain their food. This family is very numerous, and embraces many genera, very different in their habits and conformation, including some of our most common species, and many of the most interesting foreign ones; such as the Bunting, Bullfinches, Crows, Birds of Paradise, &c.



The first genus to be distinguished, is—

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* *Caprimulgus*, *Goatsucker*, *Ægothelas*, names which derive their origin from the whimsical idea, entertained by the people, of their sucking goats and even cows.

† The goatsuckers possess a very peculiar pectinated claw on the second toe, as represented in the engraving; the use of which has puzzled naturalists.

ALAUDA, *Linnæus.*

The *Larks* are known by the nail of their thumb, which is straight, strong, and much longer than the others. They are granivorous birds, and pulverators. They build on the ground, and generally sleep there.



The beak of the greater number is straight, moderately stout and pointed.

A. Arvensis. (The Sky-lark.) Is universally known by its perpendicular mode of soaring, accompanied by its varied and powerful song.

A. Cristata. (The Crested Lark.) Is about the same size as the above, but it has the power of erecting the feathers on the head into a tuft.

PARUS, *Linnæus.*

The *Titmouse* has a slender, short, conical, and straight beak, furnished with little hairs at the base, and the nostrils concealed among the feathers. It is a genus of very active little birds, which are continually flitting and climbing from branch to branch, suspending themselves therefrom in all sorts of positions, rending apart the seeds on which they feed, devouring insects wherever they see them, and not sparing even small birds when they happen to find them sick and are able to put an end to them. They lay up stores of seeds, build in the holes of old trees, and lay more eggs than any of the Passerinæ.

EMBERIZA, *Linnæus.*

The *Buntings* have a very distinct character in their conical, short, and straight beak, the upper mandible of which is narrow, sinks into the lower, and has a projecting, hard tubercle on the palate. They are granivorous, and unsuspicious birds, which run into every snare that is laid for them.

E. hortulana, Lin. (The Ortolan.) The back olive-brown; throat yellowish; the inner side of the two external feathers of the tail white. Builds in hedges; is very fat, and common in autumn.

FRINGILLA, *Linnæus.*

The *Sparrows* have a conical beak, more or less thick at base; but its commissure is not angular. They feed generally on grain, and are for the most part voracious and noxious. We subdivide them into

Ploceus (The Weavers), *Pyrgita* (Sparrows), *Fringilla* (Finches), *Carduelis* (Goldfinches), *Linaria* (Linnets,) to which belongs the Canary Bird, *Vidua* (Widows), *Coccothraustes* (Grossbeaks), *Pitylus*, and *Pyrrhula* or (Bullfinches.)

LOXIA, *Brisson.*

The *Crossbills* have a compressed beak, and the two mandibles so strongly curved, that their points cross each other, sometimes on one side, sometimes on the other. This singular beak enables them to tear out the seeds from

under the scales of the pine-cones. The European species is very common wherever there are evergreen trees; it is,

Loxia curvirostra, Lin. (The Crossbill.) The plumage of the young male is of a vivid red, with brown wings; that of the adult, and of the female, is greenish above, yellowish beneath.

We cannot remove from the Bullfinches and the Crossbills the

Corythus, *Cuvier*.

The point of whose completely arched beak curves over the lower mandible. The most known species is

Loxia enucleator, Lin. The Pine Grosbeak inhabits the north of both continents, and lives in the same way as the Crossbill. It is red, or reddish, the feathers of the tail and wings black edged with white.

Colius, *Gmelin*.*

The *Colies* also approximate considerably to the preceding birds. Their beak is short, thick, conical, and somewhat compressed, its two mandibles being arcuated, but without extending beyond each other, the quills of their tail are cuneiform, and very long; their thumb is capable of being directed forwards like the other toes; their fine and silky features are generally cinereous. They inhabit Africa and India, climb something in the manner of Parrots, live in flocks, build many of their nests on the same bush, and sleep suspended to its branches in crowds, with the head downwards. They feed on fruit.

Here also come the

Buphaga, *Brisson*.

The *Beef-Eaters* form a small genus in which the beak is of a moderate length, cylindrical at the beginning, and both mandibles inflated near the end, which terminates in a blunt point. They use it to compress the skin of cattle, in order to force out the larvæ of the Œstrus lodged in them, on which they feed.

One species only is known, and that is from Africa; brownish, with a moderate sized cuneiform tail; as large as a thrush. It is the *Buphaga Africana*.

Cassicus, *Cuvier*.

A large and exactly conical beak, thick at base, and very sharp at the point; small round nostrils, pierced on the sides; the commissure of the mandibles forms a broken line, or is angular like that of the starlings. They are American birds, whose manners are similar to those of the last-mentioned ones, living like them in flocks, frequently constructing their nests close together, and sometimes with much art. They feed on grain and insects,



* Κολοιος, the Greek name of a small species of Crow.

and do great injury to cultivated grounds. They are now divided into *Cassicus proper, Icterus,* &c. Among the latter we distinguish a species with a somewhat shorter beak, the

Icterus pecoris, Tem. (The Cow Bunting.) A violet black; head and neck a brown grey. Lives in flocks among cattle ; but the most peculiar trait in its habits is that, like the Cuckoo, it lays its eggs in other birds' nests.

Sturnus, *Linnæus.*

The *Starlings* have a beak that is depressed, especially near the point.

We can find no sufficient character to enable us to distinguish from the Conirostres, with certainty and precision, the different genera of the family of the Crows, all of which have a similar internal structure and external organs, only differing in a (generally) greater size, which sometimes enables them to hunt small birds: their strong beak is most commonly compressed on the sides.

These genera are three in number, the Crows, Birds of Paradise, and the Rollers.

Corvus, *Linnæus.*

The *Crows* have a strong beak, more or less laterally flattened, nostrils covered with stiff feathers, which incline forwards.



they are very cunning, their sense of smell is extremely acute, and they have, generally, a habit of purloining articles totally useless to them, such as pieces of money, &c. and even of hiding them.

We more particularly call Crows or Ravens, the large species whose beaks are the strongest in proportion, and in which the ridge of the upper mandible is the most arcuated. Their tail is either round or square.

C. corax, Lin. (The Raven.) Is the largest of the Passerinæ which inhabit Europe. Its size is equal to that of the Cock. Its plumage is entirely black, the tail is rounded, and the back of the upper mandible arcuated near the point. It is a more solitary bird than the other species, flies well and high, scents carrion at the distance of a league, and feeds also on fruit and small animals. It sometimes carries off poultry, builds on the tops of high trees or rocky cliffs, is easily tamed, and may be taught to speak tolerably well. It appears to be found in every part of the globe.

C. corone, Lin. (The Crow.) A fourth smaller than the Raven ; the tail more square, and the beak less arcuated above.

C. frugilegus, Lin. (The Rook.) Still smaller than the preceding, with a straighter and more pointed beak. The circumference of the base of the latter, except when very young, is divested of feathers, which is probably occasioned by its habit of thrusting it into the ground in search of food.

The Jackdaw is also a Corvus.

Pica, *Cuvier.*

The *pies* are rather smaller than the crows. The upper mandible is more arcuated than the other, and the tail long and cuneiform.

Corvus pica, Lin. (The Magpie of Europe.) A beautiful bird, of a silky black colour, with purple, blue, and gold reflections; the belly is white, and there is a large spot of the same colour on the wing. Its eternal chattering has rendered it notorious.

GARRULUS, *Cuvier.*

The two mandibles of the *Jays* are but little elongated, terminating in a sudden, and nearly equal curve; when the tail is cuneiform it is not very long, and the loose and the slender feathers of the for eheadstand more or less erect when the bird is angry.

CARYOCATACTES, *Cuvier.*

The *Nutcrackers* have the two mandibles straight, equally pointed, and without any curve. There is only one species known.

Corvus caryocatactes, Lin. (The common Nutcracker.) Brown; the whole body spotted with white. It builds in the hollows of trees, in dense mountain forests, climbs trees and perforates their bark like the Woodpeckers; feeds on all kinds of fruit, insects, and small birds.

CORACIAS, *Linnæus.*

The *Rollers* have a strong beak, compressed near the point, which is a little hooked. The nostrils are oblong, placed at the edge of the feathers, but without being covered by them; the feet short and stout. They belong to the eastern continent, and are like the Jays in their habits and in the loose feathers on the forehead. Their colours are vivid, but rarely harmonious.

PARADISÆA, *Linnæus.*

The *Birds of Paradise*, like the Crows, have a strong, straight, compressed beak, without any emarginations, and with covered nostrils; but the influence of the climate they inhabit, an influence extended to birds of several other genera, gives a velvet tissue to the feathers which cover these nostrils, and frequently a metallic lustre, at the same time that it singularly developes those which cover several parts of the body. They are natives of New Guinea and of the adjoining islands, are said to live on fruits, and to be particularly fond of aromatics.



The feathers on the flanks of some of them are silky, and singularly extended into bunches longer than the body, which give such a hold to the wind that they are very often swept away by it. There are also two bearded filaments adhering to the rump, which are as long and sometimes even longer than the feathers on the flanks.

P. apoda, Lin. Size of a thrush; maronne; top of the head and neck yellow; circumference of the beak and throat of an emerald green. It is the male of this species which is ornamented with those long bundles of yellowish feathers employed by the ladies as plumes.

FAMILY IV.

TENUIROSTRES.

This family comprehends the remaining birds of the first division; those in which the beak is slender, elongated, sometimes straight, and sometimes more or less arcuated, and without any emargination. They are to the Conirostres what the Motacillæ are to the other Dentirostres.



SITTA, *Linnæus.*

The *Nuthatches* have a straight, prismatic, pointed beak, compressed near the point, which they employ like the Woodpeckers to perforate the bark of trees, and in withdrawing the larvæ contained in it; but their tongue is not extensible; and although they climb in every direction, they have but one toe behind, which it is true is a strong one. The tail is of no use in supporting them, as is the case with the Woodpeckers and True Creepers.

CERTHIA, *Linnæus,*

Or the *Creepers,* have an arcuated beak, but that is the only common character they possess. The True Creepers, so called from their habit of climbing trees like Woodpeckers, in doing which they make use of their tail as a prop or supporter, are known by the quills of the tail, which are worn, and terminate in a stiff point, like those of the same birds. They are divided into various subgenera.

TROCHILUS, *Linnæus.*

The *Hummingbirds,* so celebrated for the metallic lustre of their plumage, and chiefly for those plates, brilliant as precious stones, which are formed by scaly feathers of a peculiar structure, on their throat or head; have a long slender beak, inclosing a tongue which they can protrude at will like the Woodpeckers (and by the same mechanism), which is split almost to its base, forming two filaments, employed, as is asserted, in taking up the nectar from flowers. They also, however, feed on small insects, for we have found their stomach filled with them. Their very small feet, broad tail, excessively long and narrow wings, short humerus, and large sternum, which is without emargination, all contribute to form a system adapted for great power of flight, similar to that of the Swallow. The narrowness of their wing is caused by the rapid abbreviation of its quills. By these means, they balance themselves in air with nearly as much facility as certain flies, and it is thus that they hum about flowers and fly with more proportionate rapidity than any other bird. They live singly, defend their nests with courage, and fight desperately with each other.





UPUPA, *Linnæus.*

The *Hoopoes* have an ornament on the head formed of a double range of long feathers, which they can erect at will. The subgenera are *Promerops* and *Epimachus*.

The second and smallest division of the Passerinæ comprehends those in which the external toe, which is nearly as long as the middle one, is united to it as far as the penultimate articulation. We make but one single group of them, the SYNDACTYLÆ, which has long been divided into six genera. The third genus, ALCEDO, has been divided by separating from the Kingfishers the CEYX: birds having the same kind of bill, but in which the external toe is deficient.



MEROPS, *Linnæus.*

The *Bee-eaters* have an elongated beak, triangular at base, slightly arcuated and terminating in a sharp point. There is a double emargination on each side of the hind part of the sternum. Their long pointed wings, and short feet render their flight similar to that of Swallows. They pursue insects in great flocks, especially bees, wasps, &c.; and it is remarkable that they are never stung by them.

PRIONTES, *Illiger.*

The *Motmots* have their feet and carriage, but differ in the beak, which is stronger, the edges of both mandibles being serrated; and in their tongue, which, like that of the Toucans, is barbed. They are beautiful birds, as large as the Magpie; the plumage on the head loose as in the Jays, and a long cuneiform tail; the stems of the two middle quills being stripped of their webs for a short distance near the extremities, gives to the whole a singular appearance. They fly badly, are solitary, build in holes, feed on insects, and even on small birds.

ALCEDO, *Linnæus.*

The *Kingfishers* have shorter feet than the Bee-eaters, and the beak much longer, which is straight, angular, and pointed; the tongue and tail are very short. They feed on small fish, which they capture by precipitating themselves into the water from some branch where they have remained perched, watching for their prey. They nestle like Bee-eaters in holes on the banks of streams, and are found in both continents.

TODUS, *Linnæus.*

The *Todies* are small birds of America, resembling the Kingfishers in their general form as well as in their feet and elongated beak, but the latter is horizontally flattened, and obtuse at the point. The tarsus also is higher, and the tail not so short. They feed on flies, and build on the ground.

BUCEROS, *Linnæus.*

The *Hornbills* are large birds of Africa and India, whose enormous dentated beak is studded with excrescences which sometimes equal in size the beak itself, and which are always of considerable extent above. This renders them very remarkable, and allies them to the Toucans; while at the same time

their carriage and habits approximate them to the Crows, and their feet to the Bee-eaters and the Kingfishers. The shape of these excrescences on the beak varies with age, and in the very young bird they are not even visible; the interior is generally cellular. They live on all sorts of food, eat soft fruits, hunt mice, small birds, reptiles, and do not even despise carrion.

ORDER III.

SCANSORIÆ.

This order is composed of those birds whose external toe is directed backwards like the thumb, by which conformation they are the better enabled to support the weight of their bodies, and of which certain genera take advantage in clinging to and climbing upon trees. It is from this that they have received the common name of *climbing birds*, which in strictness is not applicable to all of them, as there are many true climbers which by the disposition of their toes cannot belong to this order, instances of which we have already seen in the creeper and nuthatch.

The Scansoriæ usually nestle in the hollows of old trees; their powers of flight are middling; their food, like that of the Passerinæ, consists of insects or fruit, in proportion as their beak is more or less stout; some of them, the woodpeckers for instance, have peculiar means for obtaining it.

GALBULA *Brisson.*



The *Jacamars* are closely allied to the kingfishers by their elongated sharp-pointed beak, the upper ridge of which is angular, and by their short feet, the anterior toes of which are almost wholly united; these toes, however, are not precisely the same as those of the kingfishers; their plumage moreover is not so smooth, and always has a metallic lustre. They are solitary birds, that live in wet forests, feed on insects, and build on low branches.

The American species have a longer and perfectly straight beak.

PICUS, *Linnæus.*





The *Woodpeckers* are well characterised by their long, straight, angular beak, the end of which is compressed into a wedge, and fitted for splitting the bark of trees; by their slender tongue, armed near the tip with spines that curve backwards, which by the action of the elastic horns of the hyoid bone can be thrust far out of the beak, and by their tail, composed of ten quills with stiff and elastic stems, which acts as a prop in supporting them while they are climbing. They are climbers *par excellence*; they wander over trees in every direction, striking the

bark with their beaks, and insinuating their long tongue into its cracks and crevices to obtain the larvæ of insects, on which they feed. Fearful and wary, they pass most of their time in a solitary manner, but at a certain season they may frequently be heard tapping loudly and rapidly on a dry branch. They build once a year in holes of trees, and each sex alternately broods upon the eggs until they are hatched.

Yunx, *Linnæus.*

The *Wrynecks* have the protractile tongue of the woodpeckers, which is also moved by the same kind of mechanism, but the spines are wanting; their straight and pointed beak is nearly round, and without any angles; the quills of their tail are like those of birds in general. Their mode of life is that of the woodpeckers, except that they climb but seldom.

Cuculus, *Linnæus.*

The *Cuckoos* have a middling, well cleft, compressed, and slightly arcuated beak; the tail long. They live on insects, and are birds of passage. They are celebrated for the singular habit of laying their eggs in the nests of other insectivorous birds; and, what is not less extraordinary, these latter, which are often a considerably smaller species, take as much care of the young cuckoo as of their own true offspring, and that too, even when its introduction has been preceded, which often happens, by the destruction of their eggs. The rationale of this phenomenon is unknown.



Malcoha, *Vaillant.*

A very stout beak, round at base, and arcuated near the point, with a large naked space about the eyes. The nostrils of some are round, and placed near the base of the beak; in others they are narrow, and situated near its edge. They are natives of Ceylon; and, as it is said, live chiefly on fruit.

Scythrops, *Latham.*

The beak still longer and stouter than that of malcoha, and grooved on each side with two shallow longitudinal furrows; circumference of the eyes naked; nostrils round. These birds approach the toucans in their beak; but their simple tongue, which is not ciliated, separates them. One species only is known, which is as large as a crow, whitish, with a grey mantle; found in New Holland.

Bucco, *Linnæus.*

The *Barbets* have a thick conical beak, inflated on the sides of its base, and furnished with five bundles of stiff hairs directed forwards; one behind the nostril, one on each side of the base of the lower jaw, and the fifth under its symphysis. The wings are short, and their proportions are heavy, as is also their flight. They live on insects, and will attack small birds; they also eat fruit. They build in the hollows of trees.



Trogon, *Linnæus.*

The *Couroucoui*, along with the hairy fasciculi of the barbets, have a short beak, which is more broad than high, and curved from the base, its upper ridge arcuated and blunt. Their small feet, feathered nearly down to the toes, long broad tail, fine light and dense plumage, give them quite a different air. Some part of their plumage usually has a metallic lustre, the remainder being coloured more or less vividly. They build in hollow trees, live on insects, and remain in a solitary and quiet mood on low branches in the centre of marshy forests, never being seen on the wing except during the morning and evening. They are found in both continents.



Crotophaga, *Linnæus.*

The *Ani* are known by their beak, which is thick, compressed, arcuated, entire, elevated, and surmounted with a vertical and trenchant crest.

Two species are known, *Cratophaga major* and *Croto ani*, both from the hot and low districts of America. Their tarsi are strong and elevated, the tail long and rounded, and the plumage black.

These birds feed on insects and grain, and live in flocks, several couples laying their eggs, and even brooding over them in the same nest, which, together with the branches that support it, is of a size proportioned to the number of couples that have constructed it. They are easily tamed, and may be taught to speak, but their flesh has a disagreeable odour.

Ramphastos, *Linnæus.*

The *Toucans* are easily distinguished from all other birds by their enormous beak, which is almost as thick and as long as their body, light and cellular internally, arcuated near the end, and irregularly indented along its edges; and by their long, narrow, and ciliated tongue. They are confined to the hot climates of America, where they live in small flocks, feeding on fruit and insects; they also devour other birds' eggs, and their callow offspring. The structure of their beak compels them to swallow their food without mastication. When they have seized it, they toss it into the air to swallow it with more facility.



Psittacus, *Linnæus.*

The *Parrots* have a stout, hard, solid beak, rounded on all sides and enveloped at base by a membrane in which the nostrils are pierced, and a thick, fleshy, and rounded tongue; two circumstances which give them the greatest facility in imitating the human voice. Their inferior larynx, which is complicated and furnished on each side with its three muscles, also contributes to this facility. Their vigorous jaws are set in motion by a greater number of muscles than is found in any other birds. They feed on all sorts of fruit,



Head of a Paroquet.

climb among the branches of trees by the aid of their beak and claws, and



build in hollow trees. Their voice is naturally harsh and disagreeable, and they are almost universally ornamented with the brightest colours, hardly any of them being found beyond the torrid zone. They exist, however, in both continents, the species of course differing in each. Every large island even has its peculiar species, the short wings of these birds not allowing them to cross any great extent of water. The parrots, consequently, are very numerous: they are subdivided by the forms of their tails and some other characters. Among those which have a long cuneiform tail, we may distinguish the *maccaws* (Aras), whose cheeks are divested of feathers, as in the first figure; the second figure represents the *cockatoos*, marked by a crest which can be raised or depressed at pleasure.



There are two African birds, closely allied to each other and generally



placed among the Scansoræ, which appear to me to have some analogy with the Gallinaceæ, and especially with the Hoccos.

They have the tail and wings of the hoccos, and like them perch on trees; the beak is short, and the upper mandible gibbous; there is a short membrane between the fore toes, but the external one, it is true, is often directed backwards like that of the ululæ. Their nostrils, also, are simply pierced in the horn of the beak, the edges of the mandibles are dentated, and the sternum (at least that of the touraco) has not those large emarginations, so common in the gallinaceæ. There are two genera of these birds: the first is,



Corythaix, *Illiger*,

Or the *Touracos*, in which the beak does not mount on the forehead, and the head is furnished with an erectile tuft. The most common species,

Cuculus persa, Lin., is found in the vicinity of the Cape of Good Hope. It is a beautiful green, with part of the quills of the wings crimson. It builds in hollow trees, and feeds on fruit. The second is the

Musophaga, *Isert*,

Or the *Plantain-eaters*, so called because their principal food is the fruit of the banana. They are characterised by the base of the beak forming a disk which partly covers the forehead. The species known is

M. Violacea, Viell. Circumference of the eyes naked and red; violet-coloured plumage; occiput and primary quills of the wings, crimson; a white one passes below the naked space round the eye. Inhabits Guinea and Senegal.

ORDER IV.

GALLINACEÆ.

GALLINÆ, *Linnæus.*

THESE birds are so called from their affinity with the domestic cock, and, like it, generally have the upper mandible arched, the nostrils pierced in a broad membranous space at the base of the beak, and covered by a cartilaginous scale; a heavy carriage, short wings, and the bony sternum diminished by two emarginations, so wide and deep that they occupy nearly the whole sides, its crest being truncated obliquely forwards so that the sharp point of the fourchette is only joined to it by a ligament, circumstances which, by greatly impairing the strength of the pectoral muscles, render it difficult for them to fly. Their tail generally consists of fourteen quills, and sometimes of eighteen. With the exception of the hocco, they all lay their eggs on the ground, on a few carelessly arranged blades of straw or grass.





This order is chiefly composed of one very natural family, remarkable for having furnished us with most of our domestic poultry, and abundance of excellent game.

ALECTOR, *Merr**.

The *Hoccos* are large gallinaceæ of America, which resemble turkeys, with a broad, rounded tail, formed of large and stiff quills. They live in the woods, feed on buds and fruit, perch and build on trees, are very social, and easily domesticated.

The remaining genera belonging to this division are *Ourax* (Stone Bird), *Penelope* (The Guans or Yacous), *Ortialida*, and *Opisthocomus*.

PAVO, *Linnæus.*

The *Peacocks* are characterised by an aigrette or crest on the head, and by the coverts of the tail of the male being larger than its quills, and capable of being erected so as to form a circle. The shining, lax, and silky barbs of these feathers, and the ocellated spots that decorate their extremities, are well known in the





P. Cristatus, Lin. (The Common Peacock.) This superb bird, originally from the north of India, was introduced into Europe by Alexander. Its magnificent plumage is even surpassed in brilliancy by that of the wild ones.

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* ALECTOR is the Greek name of the cock.

MELEAGRIS, *Linnæus**.

The *Turkeys* have their head and upper part of the neck invested with a plumeless and papillated skin; an appendage under the throat, and another conical one on the forehead, which, in the male, when excited by passion, becomes so inflated and long as to hang over the point of the beak. From the lower part of the neck of the adult male hangs a tuft or tassel of stiff hairs; the coverts of the tail, shorter and stiffer than in the peacock, can be erected and displayed in the same way. The tarsi of the male are armed with weak spurs. But one species was known for a long time.

Meleagris gallo-pavo, Lin. (The Common Turkey.) Introduced into Europe from America in the sixteenth century. The size of this noble bird, and the goodness of its flesh, have rendered it extremely common. The wild turkey of America is of a greenish brown, with a copper gloss. A second species, however, (*M. ocellata*, Cuv.) has lately been described, almost equal to the peacock in the brilliancy of its colours, and particularly in the sapphire-coloured spots, surrounded with circles of gold and ruby, which decorate the tail. It was captured in the bay of Honduras.

NUMIDA, *Linnæus*.

The *Guinea-fowls*, or *Pintados*, have a naked head, fleshy wattles at the bottom of the cheeks, a short tail, and the cranium generally surmounted with a callous crest.

N. meleagris, Lin. (The Common Guinea-Hen.) Originally from Africa, has a slate-coloured plumage, every where sprinkled with small, white, round spots. In a wild state they live in large flocks, and prefer the vicinity of marshes. There are two species. The great genus

PHASIANUS, *Linnæus*,

Or that of the *Pheasants*, is characterised by the cheeks being partly destitute of feathers, and covered with a red skin, and by the tectiform tail, in which the feathers are variously disposed.

This great genus is now divided into various subgenera, such as *Gallus* (our common cock and hen) of which several wild species are known, *pheasants properly so called* (common pheasant of Europe, gold and silver pheasants of China, &c.), *tragopan*, &c.

TETRAO, *Linnæus*.

This also is a great genus, characterised by a naked and most generally red band, which occupies the place of the eye-brow. It is divided into subgenera as follows:—

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* MELEAGRIS is the Greek name of the guinea-hen, erroneously applied by Linnæus to the turkey.

TETRAO, *Latham.*

The feet of *Grous* are covered with feathers, and are without spurs. Those to which this name is more particularly applied have a round or forked tail and naked toes.

In some the feathers on each side of the neck of the males are turned up like a mantlet, or two scrolls: their habits have an affinity with those of the turkey. Such are

Tetr. umbellus and *togatus*, Gm.; called *Partridge* in New England, and *Pheasant* in Pennsylvania. Found in the mountain forests.

Tetr. cupido, Gm. (The Pinnated Grous.) Variegated with brown and fawn colour; tail brown; tarsi feathered down to the toes; the feathers on the bottom of the male's neck turn up into two pointed scrolls, beneath which is a naked skin, which he inflates like a bladder; his voice sounds like a trumpet. Found on extensive plains, and is such delicious food that laws have been passed to preserve them. The name of

LAGOPUS,

Or *Ptarmigan*, is more particularly applied to those species which have a round or square tail, and whose toes are feathered as well as the legs.

Tetr. albus, Gm., called of Hudson's Bay. (The White Ptarmigan.) From the whole north; is larger, and its summer plumage more red; its belly remains white.

PERDIX, *Brisson.*

Partridges have the tarsi naked like the toes. Among them the

FRANCOLINUS, *Temminck*,

Is distinguished by a longer and stronger beak, a larger tail, and, generally speaking, by stout spurs.

COMMON PARTRIDGES

Have a somewhat weaker beak; the spurs of the males are either short, or mere simple tubercles; they are deficient in the female.

COTURNIX.

Quails are smaller than Partridges, with a slenderer beak and shorter tail; no red eye-brow nor spurs.

THE PARTRIDGES AND QUAILS OF AMERICA

Have a stouter, shorter, and more convex beak; the tail is somewhat larger. They perch on bushes, and, when disturbed, even on trees. Several of them migrate like the quails of Europe. There are some other subgenera.

TINAMUS, *Latham*,

Or the *Tinamous*, is a genus of American birds, very remarkable for a slender and long neck (although their tarsi are short), covered with feathers, the tips of whose barbs are slender and slightly curled, which gives a very

peculiar air to that part of their plumage. The beak is long, slender, and blunt at the end; somewhat arched, with a little groove on each side; the nostrils are pierced in the middle of each side, and penetrate obliquely backwards. Their wings are short, and they have scarcely any tail. The membrane between the base of the toes is very short. Their thumb, reduced to a spur, cannot reach the ground. The circumference of the eye is partly naked. They either perch on low branches of trees, or hide among tall grass; they feed on fruits and insects, and their flesh is good. Their size varies from that of the pheasant down to that of the quail; some of them are even still smaller.

Columba, *Linnæus.*

The *Pigeons* may be considered as forming a slight transition from the Gallinaceæ to the Passerinæ. Like the former, their beak is vaulted, the nostrils perforated in a broad membraneous space, and covered with a cartilaginous scale, which even forms a bulge at the base of the bill; the bony sternum is deeply and doubly emarginated, although somewhat differently; the crop extremely dilated, and the lower larynx furnished with but a single proper muscle; but there is no other membrane between the base of their toes than that which results from the continuity of the edges. Their tail is composed of twelve quills. They fly well, live in a state of monogamy, build on trees or in fissures among rocks, and lay but few eggs at a time, generally two; it is true they lay frequently. The male assists his mate in the business of brooding. They nourish their young by disgorging macerated grain into their crop. They form but one genus, which naturalists have attempted to divide into several subgenera, from the greater or less strength of the bill and the proportions of the feet.

ORDER V.

GRALLATORIÆ.

Grallæ, *Linnæus.*

The birds of this order derive their name from their habits, and from the conformation which causes them. They are known by the nudity of the lower part of their legs, and most generally by the height of their tarsi; two circumstances which enable them to enter the water to a certain depth without wetting their feathers; to wade through it and seize fish by means of their neck and bill, the length of which is usually proportioned to that of the legs. Those which are furnished with a strong bill feed on fish and reptiles, while such as have a weak one consume worms and insects. A very few feed partially on grain, and they alone live at a distance from rivers, &c. The external toe is most commonly united at its base with that of the middle one, by means of a short



membrane; sometimes there are two similar membranes, and at others they are entirely wanting, and the toes are completely separated; it sometimes also happens, though rarely, that they are bordered all along, or palmated to the very end; in fine, the thumb is deficient in several general circumstances, all of which have an influence on their mode of life, which is more or less aquatic. Almost all these birds, the ostriches and cassowaries excepted, have long wings, and fly well; during which action they extend their legs backwards, differing in this from all others, which fold them under the belly.

In this order we establish five principal families, and some insulated general

FAMILY I.

BREVIPENNES.



These birds, although similar in general to the other Grallatoriæ, differ from them greatly in one point—*the shortness of the wings*, which renders flight impossible. The beak and regimen give them numerous affinities with the Gallinaceæ.

It appears as if all the muscular power which is at the command of nature, would be insufficient to move such immense wings as would be required to support their massive bodies in the air. The sternum is a simple buckler, and is deficient in that ridge which is found in all other birds. The pectoral muscles are thin and delicate, but the posterior extremities regain what the wings have lost—the muscles of the thighs, and of the legs in particular, being enormously thick and stout.

The thumb is always deficient. The number of phalanges in the ostrich, commencing with the internal toe, is 4, 5, cassowary 3, 4, 5, which amount to the number common in birds. They form two genera.

Struthio, *Linnæus.*

The *Ostriches* have wings furnished with loose and flexible feathers, but still sufficiently long to increase their speed in running. Every one knows the elegance of these slender-stemmed plumes, the barbs of which, although furnished with little hooks, always remain separate, contrary to what takes place in most other birds. Their beak is horizontally depressed, of a moderate length, and blunt at the end; their tongue short, and rounded like a crescent; their eye large, and the lid fringed with lashes; their legs and tarsi very long. They have an enormous crop, a large sac between the crop and gizzard, voluminous intestines, and a vast reservoir, in which the urine accumulates as in a bladder, being the only birds which can be said to contain urine. But two species are known, each of which might form a separate genus.

Struthio camelus, Lin. (The Ostrich of the Eastern Continent.) But two

toes, the external of which is one half shorter than its fellow, and has no nail. This bird, so highly celebrated from the earliest ages, abounds in the sandy deserts of Arabia and Africa. It attains the height of six or eight feet, lives in great troops, lays eggs, each weighing nearly three pounds, which, in very hot climates, it is contented with exposing in the sand to the warmth of the sun, but over which, out of the tropics, it broods with great care, defending them courageously every where. The ostrich feeds on grass, grain, &c.; and so obtuse is its sense of taste, that it swallows pebbles, pieces of iron, copper, &c. When pursued it dashes stones behind it with great violence. No animal can overtake it in the race.

Struth. rhea, Lin. (The American Ostrich*.) Is about one half smaller, with more thinly furnished feathers, of a uniform grey colour; and particularly distinguished by its three toes, all having nails. Its plumage is greyish, browner on the back; a black line along the back of the neck in the male. It is as common in the southern parts of South America, as the preceding one is in Africa. When taken young it is easily tamed. Several females, it is said, lay in the same nest, or rather the same hole, yellowish eggs, which are hatched by the male. It is only eaten when very young.

Casuarius, *Brisson.*

The *Cassowaries* have wings still shorter than those of the Ostrich, and totally useless, even in running. There are three toes to all the feet, each furnished with a nail; the barbs of their feathers are so poorly provided with barbulæ that at a distance they resemble pendent hairs. Two species are known, each of which might also constitute a genus.

Casuarius vulgaris, Lin. (The Cassowary.) The beak laterally compressed; head surmounted by a bony prominence, covered with horny substance; skin of the head and top of the neck naked, of an azure blue and a fiery red colour, with pendent caruncles like those of the turkey; some stiff stems in the wings, wthout barbs, which the bird uses as weapons in combat; nail of the internal toe much the strongest. It is the largest of all birds, next to the ostrich, and differs considerably from it in its anatomy. It feeds on fruit and eggs, but no grain. The female lays a small number of green eggs, which, like the ostrich, she abandons to the solar heat. Found in different islands of the Archipelago of India.

Cas. Novæ Hollandiæ, Lath. (The Cassowary of New Holland.) A depressed beak; no helmet on the head; a little naked skin about the ear; plumage brown, and more of it; more barbs to the feathers; no caruncles, or spurs on the wing; nails of the toes about equal. Its flesh resembles beef. Its speed is greater than that of the swiftest greyhound. The young ones are striped with brown and black.

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* Buffon and Brisson have improperly applied to the Ostrich the name of *Touyou*, which properly belongs to the Jabiru. The Portuguese of Brazil give it the name of *Emeu*, which properly belongs to the Cassowary.

FAMILY II.

PRESSIROSTRES.

This family comprises genera with long legs, without a thumb, or in which the thumb is too short to reach the ground. The bill is moderate, but strong enough to penetrate the earth in search of worms; hence we find those species in which it is weakest frequenting meadows and newly ploughed grounds to obtain that sort of food with more facility. Such as have stronger beaks also feed on herbs, grain, &c.



Otis, *Linnæus.*

The *Bustards*, in addition to the massive carriages of the Gallinaceæ, have a long neck, long legs, and moderate beak; its superior mandible being slightly arcuated and arched, which, as well as the very small membranes between the base of the toes, again recal the idea of the Gallinaceæ. But the nakedness of the lower part of their legs, their whole anatomy, and even the flavour of their flesh, place them among the Grallatoriæ; and as they have no thumb, the smaller species approximate closely to the plovers. Their tarsi are reticulated and their wings short; they fly but seldom, hardly ever using their wings, except to assist themselves in running. They feed indifferently on grain and herbs, worms and insects.

O. tarda, Lin. (The Great Bustard.) Back of a bright fawn colour, crossed with numerous black streaks, the remainder greyish. This species builds on the ground among the grain.

Charadrius, *Linnæus.*

The *Plovers* have no thumb; the beak is moderate, compressed, and enlarged at the point.



They may be divided into two subgenera; viz. Œdicnemus, Tem. (The Thick-knee), in which the end of the beak is inflated above as well as beneath, and the fossæ of the nostrils only extend half its length: and Charadrius, Cuv. The beak of the True Plovers is only inflated above, and has two-thirds of its length occupied by the nasal fossæ, which render it weaker. They live in large flocks, and frequent low grounds, where they strike the earth with their feet, in order to set in motion the worms on which they feed. One is

Char. pluvialis, Lin. (The Golden Plover.) Blackish; the edges of its feathers dotted with yellow; white belly. It is the most common of all, and is found throughout the whole globe.

VANELLUS, *Bechstein.*—TRINGA, *Linnæus.*

The *Lapwings* have the same kind of beak as the Plovers, and are only distinguished from them by the presence of a thumb; but it is so small that it cannot reach the ground. In the first tribe, that of the lapwing plovers (*Squatarola,* Cuv.) it is even scarcely visible. They are distinguished by the bill, which is inflated underneath, the nasal fossæ being short like that of the Œdicnemus. The feet are reticulated; all those of France have the tail striped with white and black, forming, it is supposed, only one species, whose great diversity of plumage has occasioned its multiplication. They are generally found with the plovers.

The True Lapwings have a more decidedly marked thumb, and tarsi partially scutellated. They are equally industrious in the pursuit of worms as the plovers, and they procure them by the same means.

HÆMATOPUS, *Linnæus* *.

The *Oyster-catchers* have a somewhat longer beak than the plovers or the lapwings; it is straight, pointed, compressed into a wedge, and sufficiently strong to enable them to force open the bivalve shells of the animals on which they feed. They also seek for worms in the earth. Their legs are of a moderate length, their tarsi reticulated, and their feet divided into three toes.

It is impossible to avoid placing near the Plovers and Oyster-catchers, the

CURSORIUS, *Lacepede.*

Whose beak more slender, but equally conical, is arcuated, has no groove, and is moderately cleft; the wings are shorter; and their legs, which are longer, are terminated by three toes without membranes and without a thumb.

As far as we can judge from their exterior, it is here that we can most conveniently place the

MICRODACTYLUS, *Geoffroy.*—DICHOLOPHUS, *Illiger* †.

Whose beak is longer and more hooked, the commissure extending under the eye, which gives them something of the physiognomy and disposition of birds of prey, and approximates them somewhat to the herons. Their extremely long and scutellated legs are terminated by very short toes, slightly palmated at base, and by a thumb which cannot reach the ground.

One species only is known, and that is from South America, the *Micro. cristatus,* Geoff. It is larger than the heron, and feeds on lizards and insects, which it hunts for on high grounds and along the edges of forests.

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* Blood-coloured feet.

† *Microdactylus,* short-finger. *Dicholophus,* crest in two rows.

FAMILY III.

CULTRIROSTRES.

This family is recognised by the thick, long, and strong beak, which is most generally trenchant and pointed, and is almost wholly composed of the birds comprised in the genus Ardea of Linnæus. In a great number of species, the trachea of the male forms various curves.



We subdivide it into three tribes; the Cranes, the True Herons, and the Storks. The first tribe forms but one great genus.

Grus, *Linnæus.*

The *Cranes* have a straight beak, but slightly cleft; the membranous fossæ of the nostrils, which are large and concave, occupy nearly one half of its length. Their legs are scutellated, and the toes moderate; the external ones but slightly palmate, and the thumb hardly reaching to the ground. A more or less considerable portion of the head and neck is destitute of feathers in nearly all of them.

We first find Psophia, Lin., or the *Trumpeters*, which have a shorter beak than the other species; the head and neck are merely invested with down, and the circumference of the eye is naked. They live in the woods, and feed on grain and fruit.

The species best known is from South America, and is called the *Trumpeter*, from its faculty of producing a low, deep sound. It is a very grateful bird, and as susceptible of attachment to man as a dog. It is even said to be so docile as to take the command of the poultry-yard. It flies badly, but runs fast, and builds on the ground at the foot of a tree. Its flesh is eaten.

Certain Cranes foreign to Europe, with a shorter beak than is found in those that belong to it, should come next. Such is the *Crowned Crane* from Africa.

The *Common Cranes* have a beak as long as the head, or longer: to which belongs the common species celebrated for its migrations.

Between the Cranes and Herons we must place

Ard. helias, Lin. (The Sun-Bird.) It is about the size of a partridge; and its long slender neck, broad and open tail, and rather short legs, give it a very different appearance from that of any other wader. Its plumage, shaded in bands and lines with brown, fawn-colour, red, grey, and black, recals to our minds the colouring of the most beautiful of the nocturnal Lepidoptera. It is found on the banks of the rivers in Guiana.

The second tribe is more carnivorous, and is known by its stronger beak and larger toes: we may place at its head,

CANCROMA, *Linnæus.*

The *Boat-bill,* which would closely approach the herons in the strength of the beak and in the regimen resulting therefrom, but for the extraordinary form of that organ, which we shall find, however, by close examination, to be nothing more than the beak of a heron or bittern, very much flattened. In fact, it is very wide from right to left, and is formed like two spoons, the concave sides of which are placed in contact. The mandibles are strong and trenchant, the upper one having a sharp tooth on each side of its point; the nostrils, situated near its base, are continued on in two parallel grooves to near the point. There are four toes to the feet, long, and almost without membranes; and accordingly we find that these birds perch upon trees on the banks of rivers, whence they precipitate themselves upon the fish, which constitute their customary food. Their gait is slow, and in their attitudes they resemble the herons. The species known is

Cancr. cochlearia, Lin. (The Boat-bill.) Size of a hen; whitish, grey, or brown back; red belly; a white forehead, followed by a black calotte, which, in the adult male, is changed into a long tuft: inhabits the hot and marshy parts of South America.

Then come

ARDEA, *Cuvier,*

Or the *Herons,* the cleft of whose beak extends to beneath the eyes, a small nasal fossa continuing on in a groove close to its point. They are also distinguished by the internal edge of the nail of the middle toe, which is trenchant and denticulated. Their legs are scutellated; the thumb and toes tolerably long, the external web considerable, and the eyes placed in a naked skin which extends to the beak. They are melancholy birds, which build and perch on the banks of rivers, where they destroy great numbers of fish.

The True Herons have a very slender neck, ornamented below with long pendent feathers.

The name of CRABEATERS (*Crabiers*) has been applied to the smallest Herons, with shorter feet.

The feathers on the neck of the BITTERNS are loose and separated, which increases its apparent size. They are usually spotted or striped.

The adult NIGHT-HERON, with the port of the Bitterns, and a beak proportionally thicker, has a few slender feathers on the occiput.

The third tribe, besides having a thicker and smoother beak than is found in the second, has tolerably strong and almost equal membranes between the base of the toes.

CICONIA, *Cuvier.*

The *Storks* have a thick beak, moderately cleft; no fossæ or grooves; the nostrils pierced towards the back and near the base; an extremely short tongue. Their legs are reticulated, and the anterior toes strongly palmated at base, particularly the external ones, the light and broad mandibles of their beak,

by striking against each other, produce a clash which is almost the only sound that proceeds from these birds.

To this genus belongs the celebrated *White Stork*, and the Black Stork.

We next distinguish the *Bare Necked Storks;* and then the *Pouched Storks*, so called from an appendage under the throat resembling a sausage. There are two species; one from Senegal, the other from India.

Mycteria, *Linnæus.*

The *Jabirus*, separated from Ardea by Linnæus, are closely allied to the Storks, and much more so than the latter are to the True Herons. Their peculiar character consists in a beak slightly curved upwards near the extremity.

Scopus, *Brisson*.*

The *Umbres* are only distinguished from the storks by a compressed beak, whose trenchant ridge is inflated near the base, and whose nostrils are continued by a groove, which runs parallel with the ridge to its end, the latter being slightly hooked. Only one species is known, *Scop. umbretta*, which is the size of a crow, and of an umber colour. The occiput of the male is tufted. Found throughout Africa.

The genus Hians, Lacep., is only separable from the Storks by a character of but little consequence; and that of Dromas, Payk., is very similar to it; but the under part of its compressed beak is perforated by oval nostrils, and its edges join closely. In *Hians* they do not.

Tantalus, *Linnæus.*

The *Wood-Pelicans* have the feet, nostrils, and beak of the stork; but the back of the beak is rounded, its point curved downwards, and slightly emarginated on each side: a part of their head, and sometimes of the neck, is destitute of feathers.



T. loculator, Lin. (The Wood Pelican of America.) Is the size of a stork, but more slender; white; quills of the wings and tail black; beak and feet, as well as the naked skin of the head and neck, blackish. It inhabits both Americas, arriving in each country about the rainy season; and frequents muddy waters, where it chiefly hunts for eels.

Platalea, *Linnæus.*

The *Spoonbills* approximate to the storks in the whole of their structure; but their bill, whence they derive their name, is long, flat, broad throughout, becoming widened and flattened, particularly at the end, so as to form a spatula-like disk; two shallow grooves, originating at its base, extend almost to the end, but without being



* *Scopus*, from Σκοπος, sentinel.

parallel to its edges. The nostrils are oval, and situated at a short distance from the origin of each groove. The expansion of their bill deprives it of all its strength, and renders it fit for nothing but turning up mud, or capturing small fish or aquatic insects.

FAMILY IV.

LONGIROSTRES.

The family is composed of a multitude of Waders. Their general character is a long, slender, and feeble bill, the use of which is restricted to searching in the mud for worms and insects; the different gradations in the form of this bill serve to divide them into genera and subgenera.

According to his own principles, Linnæus should have united most of these birds in the great genus

Scolopax, *Linnæus*,

Which we divide as follows, according to the variation in the form of the bill. The

Ibis, *Cuvier*,

Separated from the *Tantalus* of Gmelin, because the bill, though arcuated like that of the Tantalus, is much more feeble, and has no emargination near its point; the nostrils also, perforated near the back of its base, are severally prolonged in a groove which extends to the end.



Ibis religiosa, Cuv. (The Sacred Ibis.) Is the most celebrated species. It was reared in the temples of ancient Egypt, with a degree of respect bordering on adoration; and, when dead, it was embalmed. This, according to some, arose from its devouring serpents, which otherwise might have infested the country; others again are of opinion that it took its origin from some relation between its plumage and one of the phases of the moon; while a third class of authors attribute it to the fact that its appearance announced the overflow of the Nile. Found throughout Africa.

Ib. rubra. (The Red Ibis.) A bird found in all the hot parts of America, remarkable for its bright red colour; the tips of the wing-quills are black.

Numenius, *Cuvier*.

The *Curlews* have the beak arcuated like that of the Ibis, but it is more slender, and round throughout: the tip of the upper mandible extends beyond the end of the lower one, and projects a little downwards in front of it. The toes are palmated at base.

Scolopax, *Cuvier*.

The *Snipes* have a straight beak, the nasal furrows extending to near its point, which is a little inflated externally to reach beyond the lower mandible,

and on the middle of which there is a simple groove; this point is soft and very sensible, and when dried, after death, assumes a punctured appearance. Their feet are not palmated. A peculiar character of these birds consists in their compressed head and large eyes placed very far back, which gives them a singularly stupid air, an indication which is confirmed by their habits.

Our common Woodcock (*Scol. minor*) belongs to this genus, as does also the *Red-breasted Snipe*, &c.

RHYNCHÆA, *Cuvier.*

Birds of India and Africa, whose nearly equal mandibles are slightly arcuated at the end, and in which the nasal fossæ extend to the tip of the upper one, which has no third groove. Their feet are not palmated.

LIMOSA, *Bechstein.*

The *Godwits* have a straight beak, longer than the snipe's, and sometimes even slightly arcuated near the top. The nasal groove extends close to the tip, which is blunt and somewhat depressed; no third groove or punctation on its surface. The external toes are palmated at base. Their form is more slender, and their legs are longer than those of snipes; they frequent salt marshes and the sea-shore.

CALIDRIS, *Cuvier.*

The bill of the *Sandpipers* is depressed at the end, and the nasal fossæ are very long, as in the godwits, but this bill is not usually longer than the head; their slightly bordered toes have no membranes at base, and their thumb can hardly reach the ground; their moderately long legs and short figure give them a heavier carriage than that of the godwits. They are also much smaller.

ARENARIA, *Bechstein.*—CALIDRIS, *Vigors.*

The *Sanderlings* resemble the sandpipers in every point but one; viz. they have no thumb, as is the case with the plovers.

PELIDNA, *Cuvier.*

The *Pelidnæ* are merely small sandpipers, with a bill somewhat longer than the head. The edging of their feet is insensible.

MACHETES, *Cuvier.*

The *Ruffs* are true sandpipers in their bill and carriage; the membrane between their external toes, however, is nearly as extensive as in Totanus, Limosa, &c.

One species only is known, the *Tringa pugnax*, Lin. It is somewhat smaller than a snipe, and celebrated for the furious combats that take place among the males in their nuptial season. At this period the head is partly covered with red papillæ; the neck is surrounded with a thick collar of feathers, so variously arranged and coloured, and projecting in such fantastic positions, that no two individuals can be found alike; even before this epoch there is so

much diversity in their plumage, that many imaginary species have been described by naturalists.

There are some small birds in America resembling the sandpipers, whose feet are semi-palmated anteriorly (the HEMIPALAMA, Bonap.).

EURINORHYNCHUS, *Nilson.*

Distinguished from them by its depressed bill, widened at the end almost like that of the spoonbill, the only known species of which,

Eurinorhynchus griseus, Nils., is one of the rarest in existence; for only a single individual has been found: it is grey above, white beneath, and hardly as large as a pelidna.

PHALAROPUS, *Brisson.*

Small birds, whose bill, though flatter than that of the sandpipers, is similarly proportioned, and has the same grooves; the toes are also bordered with wide membranes, like those of the fulica.

STREPSILAS.

The *Turn-stones* stand rather low; the bill is short, and the toes are without membranes, like those of the true sandpipers; but this bill is conical, pointed, without any depression, compression, or inflation, and the nasal fossæ do not extend to more than half its length. The thumb barely reaches the ground. Their bill, which is stronger and stiffer in proportion than that of the preceding birds, enables them to overturn stones, beneath which they find worms.

TOTANUS, *Cuvier.*

The beak of these birds is slender, round, pointed, and solid; the nasal fossæ do not extend beyond the half of its length, and the upper mandible is slightly arcuated near the end. Their form is light and their legs long; but a small part of their thumb rests on the ground; their external web is well marked. Each of the species is found throughout almost the whole of the globe.

Among the species foreign to Europe, we should particularly notice that of North America, with the large beak and semi-palmated feet, (*Scolopax semipalmata*, Lin.) which has a short and thick beak, plumage brown-grey above, whitish beneath; brownish spots on the neck and breast; toes well bordered with equal and considerable membranes.

HIMANTOPUS*, *Brisson.*

The bill round, slender, and pointed, even more so than that of a totanus, and the nasal grooves occupy but half its length. The excessive length and tenuity of the legs, which are reticulated and destitute of a thumb, and the weakness of their bones, which is so extreme as to render walking painful to them, are what principally distinguish the species of this subgenus, and give rise to their name. This is perhaps the only place for the

* *Himantopus*, feet like a string, (alluding to their weakness) is the name given to this bird by Pliny.

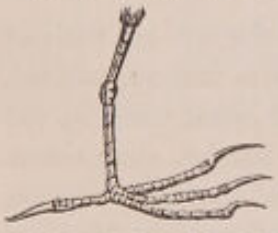
Recurvirostra, *Linnæus,*

Or the *Avosets,* although their feet, which are webbed to near the ends of the toes, almost entitle them to a situation among the Palmipedes; their high tarsi and half naked legs, their long, slender, pointed, smooth, and elastic bill, together with the mode of life resulting from this conformation, equally approximate them to the snipes. What particularly characterises, and even distinguishes them from all other birds, is the strong upward curve of their beak. Their legs are reticulated, and their thumb much too short to reach the ground.

FAMILY V.

MACRODACTYLI.

This family is furnished with very *long toes,* fitted for walking on the grass of marshes, and even for swimming, in those numerous species, especially, in which they are bordered with a membrane. There are no membranes, however, between the bases of their toes, not even between the external ones. The beak, more or less compressed on the sides, is lengthened or shortened according to the genus, never, however, becoming as slender or as weak as that of the preceding family. The body of these birds is also singularly compressed, a circumstance which is owing to the narrowness of the sternum; their wings are moderate or short, and their flight feeble. They all have a long thumb.





They have been divided into two tribes, according to the armature or non-armature of their wings; but this character is liable to exceptions.

Jacanas, *Brisson.* Parra, *Linnæus.*

The *Jacanas* are greatly distinguished from the other Grallatoriæ by having four very long toes, separated down to their root, the nails of which, that of the thumb in particular, are also extremely long and pointed, from which peculiarity they have received their vulgar name of *Surgeons.* The beak is similar to that of the lapwings in its moderate length, and in the slight inflation of its end. Their wing is armed with a spur. They are noisy and quarrelsome birds, which inhabit marshes of hot climates, where they walk with great facility by means of their long toes.

Palamedea, *Linnæus.*

The *Kamichi* resemble the Jacanas, but on a very large scale, in the two strong spurs of each of their wings, in their long toes and strong nails, that of the thumb in particular, which is long and straight as in the larks; but their beak, whose aperture is small, is but slightly compressed, and is not inflated;

the upper mandible, also, is somewhat arcuated. Their legs are reticulated. A distinct genus,

CHAUNA, *Illiger*,

Has been made of the *Parra chavaria*, Lin.; *Chaïa* of Paraguay; which has no horn on the vertex, and whose occiput is ornamented with a circle of erectile feathers. The head and upper part of the neck are only covered with down, and it has a black collar. It chiefly feeds on aquatic plants; and the Indians of Carthagena always kept some of them among their geese and chickens, as it is sufficiently courageous, according to them, to repulse even the vulture. A singular circumstance attending this bird is, that air is every where interposed between the skin and muscles, even on the legs, in such a quantity as causes it to crackle under the finger.

Of the tribe whose wings have no armature, Linnæus comprises in his genus *Fulica* such as have their beak prolonged into a sort of shield, which partly covers the forehead; and in his genus *Rallus*, those in which this peculiarity does not exist.

RALLUS, *Linnæus*.

The *Rails*, which, in other respects, have a strong mutual resemblance, present bills of very different proportions.

Ral. crex, Lin. Fawn-coloured brown, spotted with black above; greyish beneath; flanks streaked with black; red wings. It lives and builds in the fields, running through the grass with great celerity. Its name, *Crex*, expresses the sound of its note. It has been called the *Quail-King*, because it arrives and departs with those birds, and leads a solitary life on the same grounds, from which arose the conjecture that it was their leader. It feeds on grain, as well as on worms and insects.

FULICA, *Linnæus*.

The *Coots* may be divided as follows, from the form of the beak and the appliances of the feet.

GALLINULA, *Brisson* and *Latham*,

Or the *Water-Hens*. The beak very similar to that of the ground rail, from which these birds are distinguished by the shield on the forehead, and by very long toes furnished with a very narrow border.

PORPHYRIO, *Brisson*.

The beak higher in proportion to its length; very long toes, without any very sensible border; the frontal shield large, rounded in some, and square above in others. These birds stand on one foot, using the other to convey their food to the beak. Their colours are usually fine shades of blue, violet, and aqua-marina. Such is

Fulica porphyrio, Lin.; a beautiful African bird, now naturalised in several islands and coasts of the Mediterranean. Its beauty would render it an ornament to our pleasure grounds.

FULICA, *Brisson.*

The *True Coots*, in addition to a short beak and a large frontal shield, have their toes much widened by a festooned border that renders them excellent swimmers, in consequence of which their lives are passed in ponds and marshes. Their polished plumage is not less adapted to this kind of life than their conformation, and these birds establish an evident link between the order of the Grallatoriæ and that of the Palmipedes. There is but one in Europe.

F. atra, Gm. (The Coot.) The shield of a deep slate colour; edge of the wings whitish; in the nuptial season the shield becomes red: found wherever there is a pond.

We will terminate this sketch of the Grallatoriæ with three genera, which it is difficult to associate with any other, and which may be considered as forming separately so many small families.

CHIONIS, *Foster.*—VAGINALIS, *Latham.*

Or the *Sheath-Bills*. Their legs are short, almost like those of the Gallinaceæ; their tarsi scutellated, their bill stout and conical, having a hard substance enveloping its base, which, it appears, the bird has the power of raising and depressing.

Only one species is known, and that is from New Holland, *Vag. chionis*, Lath. It is the size of a partridge, with entirely white plumage. It haunts the sea-coast, where it feeds on the dead animals thrown up by the waves.

GLAREOLA.

The beak of the *Pratincoles* is short, conical, arcuated throughout; has a large opening, and resembles that of the Gallinaceæ. Their excessively long and pointed wings remind us of the Swallows, or of the Palmipedes of the high seas; their legs are of a moderate length, their tarsi scutellated, and their external toes somewhat palmated; their thumb touches the ground. Aquatic worms and insects constitute their food.

Our last genus will be that of

PHŒNICOPTERUS, *Linnæus,*

Or the *Flamingos*, one of the most extraordinary and insulated of all birds.



The legs are excessively long; the three anterior toes are palmated to their ends, and that of the hind one is extremely short; the neck quite as long and slender as the legs, and the small head furnished with a beak whose lower mandible is an oval longitudinally bent into a semi-cylindrical canal, while the upper one, oblong and flat, is bent crosswise in its middle, so as to join the other exactly. The membranous fossæ of the nostrils occupy nearly all the side of the part which is behind the transverse fold, and the nostrils themselves are longitudinal slits in the base of the fossæ. The edges of the two mandibles are furnished with

small and very delicate transverse laminæ, which, with the fleshy thickness of the tongue, creates some affinity between these birds and the ducks. Were it not for the length of their tarsi, and the nudity of their legs, we might even place them among the Palmipedes. They feed on shell fish, insects, and the spawn of fishes, which they capture by means of their long neck, turning the head on one side to give more effect to the hook of the upper mandible. They construct their nest of earth in marshes, placing themselves astride of it to hatch their eggs, a position to which they are forced to resort by the length of their legs. The species known,

Ph. ruber (The Red Flamingo), is from three to four feet in height; ash coloured, with brown streaks, during the first year; in the second there is a rosy hue on the wings, and in the third it acquires a permanent purple-red on the back, and rose-coloured wings. The quills of the wing are black; the beak yellow, with a black tip, and the feet brown.

This species is found in all parts of the eastern continent below 40°.

We have also an American species, the *Ph. ruber* of Temminck.

ORDER VI.

PALMIPEDES.

These birds are characterised by their feet, formed for swimming; that is to say, placed far back on the body, attached to short and compressed tarsi, and with palmated toes. Their dense and polished plumage saturated with oil, and the thickly set down which is next to their skin, protect them from the water in which they live. They are the only birds whose bill surpasses—which it sometimes does to a considerable extent—the length of their feet; and this is so, to enable them to search for their food in the depths below, while they swim on the surface. Their sternum is very long, affording a complete guard to the greater part of their viscera, having, on each side, but one emargination or oval foramen, filled up with membrane. The engraving shows the conformation of the stomach of the family.



This order admits of a tolerably precise division into four families.

FAMILY I.

BRACHYPTERÆ.

A part of this family has some external affinities with that of the Gallinulæ. Their legs, placed further back than in any other birds, renders walking painful to them, and obliges them, when on land, to stand vertically. In addition to this, as most of them have but feeble powers of flight, and as some

of them are wholly deprived of that faculty, we may consider them as exclusively attached to the surface of the water: their plumage is extremely dense, and its surface frequently polished, presenting a silvery lustre. They swim under water, using their wings with almost as much effect as though they were fins.

Colymbus, *Linnæus.*

The only particular character of the *Divers* is a smooth, straight, compressed and pointed bill, and linear nostrils; but the differences in the feet have caused them to be subdivided.

Podiceps, *Latham.*

The toes of the *Grebes*, instead of being palmated, are widened like those of the coots, the anterior ones only being united at base by membranes. The middle nail is flattened, and the tarsus strongly compressed. The semi-metallic lustre of their plumage has caused it to be occasionally employed as fur. Their tibia, as well as that of the succeeding subgenera, is prolonged above into a point, which gives a more efficient insertion to the extensors of the leg.



These birds live on lakes, &c., and build among the rushes. In certain circumstances, it appears that they carry their young ones under their wings. Their size and plumage are so much changed by age, as to have caused an improper multiplication of species. M. Meyer reduces those of Europe to four.

Col. cristatus, Gm. (The Crested Grebe). Is the size of a duck; blackish-brown above, silver white beneath; a white band on the wing; it acquires with age a double black tuft, and the adults have, in addition, a broad red colerette on the upper part of the neck edged with black.

Mergus, *Brisson.*—Eudytes, *Illiger**.

The *true Divers* have the feet of ordinary Palmipedes, along with all the forms of the grebes; that is, the anterior toes are united to their ends by membranes, and are terminated by pointed nails. They are northern birds, which rarely breed in France, where they arrive in winter; at which season is occasionally seen on the coast.

Col. glacialis, Lin. (The Great Northern Diver.) The adult is two feet six inches in length, its head and neck black, changing to a green with a whitish collar; back a blackish brown dotted with whitish; white beneath; the lower mandible, which has a slight curve upwards, is marked by a groove beneath.

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* *Mergus* (diver), the Latin name of some sea bird difficult to determine. *Eudytes*, a Greek word composed by Illiger, has the same meaning.

URIA, *Brisson.*

The *Guillemots* have a bill, which, though of the general form of the preceding, is covered with feathers down to the nostrils; there is also an emargination at the point which is somewhat arcuated. Their chief character, however, consists in the absence of the thumb. Their wings, much shorter than those of the divers, scarcely enable them to flutter. They feed on fish, crabs, &c.; and are found among rocky precipices when they breed.

ALCA, *Linnæus.*

The *Auks* are known by the very much compressed, vertically raised bill, which has a trenchant back, and is usually grooved transversely; and by the feet, which are completely palmated, and have no thumb like those of the guillemot. All these birds inhabit the northern seas. We may divide the genus into two subgenera.

FRATERCULA, *Brisson.*—MORMON. *Illiger.*

Or the *Puffins*, whose bill, shorter than the head, is as high and higher at base than it is long, which gives it a very extraordinary form; a folded skin usually covers its base. The nostrils, placed near the edge, are mere slits. Their small wings can just sustain them for a moment; they live upon the ocean and breed on the rocks.

The most common species, *Alca arctica*, Lin., is the size of a Pigeon, and has a black calotte and mantle, white beneath; it sometimes breeds among the cliffs on the English coast, and is very common on those of France during the winter.

ALCA, *Cuvier**.

The *true Auks* have a more elongated bill, resembling in form the blade of a knife; it is covered with feathers as far as the nostrils. Their wings are decidedly too small to support them, and therefore they never attempt to fly.

APTENODYTES, *Forster.*

The *Penguins* are even less capable of flying than the auks. Their little wings are covered with mere vestiges of feathers, which at the first glance resemble scales; their feet, placed farther behind than those of any other bird, only support them by bearing on the tarsus, which is widened like the sole of the foot of a quadruped, and in which are found three bones soldered together at their extremities. They have a small thumb directed inwards, and their three anterior toes are united by an entire membrane. They are only found in the Antarctic Seas, never going on shore except to breed. They can only reach their nests by drawing themselves along on their bellies.



The difference in their bill authorises their division into several subgenera.

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* *Alca*, Aik, Auk, the name of these birds in the Feroe Islands, and in the north of Scotland. That of *Penguin*, first given to the Aptenodytes of the south by the Dutch, indicates the oily nature of their fat.

Apt. patagonica, Gm. (The Great Penguin.) Is the size of a goose, slate-coloured above, white beneath; a black mask surrounded with a lemon-coloured cravat. Found in large troops near the Straits of Magellan, and as far as New Guinea. The flesh, though black, is eatable.

CATARRHACTES, *Brisson.*

The *Gorfus** have the bill stout, but little compressed, pointed, rounded on the back, and its point somewhat arcuated; the groove which arises from the nostril terminates obliquely on the inferior third of its edge.

FAMILY II.

LONGIPENNES.

THIS family includes those birds of the high seas which, from their immense strength of wing, are to be met with in every latitude. They are known by the freedom or nullity of the thumb; by their very long wings; and by their bill, which is not notched but hooked at the point in the first genera, and simply pointed in the others.

PROCELLARIA, *Linnæus.*

The *Petrels* have a bill hooked at the end, the extremity of which seems to consist of a distinct piece articulated with the remainder. Their nostrils are united, and form a tube laid on the back of the upper mandible; there is a nail planted in the heel, but no thumb. Of all the Palmipedes, these remain most constantly at a distance from land; and when a tempest intervenes, they are forced to seek shelter on reefs and ships, from which circumstance they derive their name of Storm Birds: that of Petrel—Little Peter—has been given to them on account of their habit of walking on the water, which they effect by the aid of their wings. They make their nests in holes of rocks, and eject on those who attack them an oily fluid with which their stomach seems to be always filled. The greater number inhabit the Antarctic Seas.



Proc. gigantea, Gm. (The Giant Petrel.) Is only found in the South Seas. It is the largest of all the species, surpassing the goose in size. Its plumage is blackish, though there are some varieties in which it is more or less white.

Certain small species, with a somewhat shorter bill and rather longer legs and black plumage, the THALISSIDROMA, Vigors, are particularly designated by sailors under the name of "Mother Carey's Chickens."

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* *Gorfu*, a corruption of *goir fugel*, the name of the Great Auk in the Feroe Islands. *Catarrhactes* is the Greek name of a very different bird, which could fly well, and precipitated itself from a height on its prey. It was most probably a species of Gull.

The most common (*Proc. pelagica*, Briss.) is scarcely larger than a lark; stands high; all brown except the rump, which is white, with a white line on the end of the great wing-coverts. When it seeks shelter on a vessel, it may be considered as the forerunner of a hurricane.

We separate, with Brisson, under the name of

PUFFINUS,

Or *Puffins*, those in which the end of the lower mandible is curved downwards along with that of the upper one, and in which the nostrils, although tubular, do not open by one common orifice, but by two distinct holes. Their bill also is proportionally longer.

Proc. puffinus, Gm. Cinereous above; whitish beneath; wings and tail blackish: the young is darker. Its size is that of a crow. Very common in almost every sea. Another species, sometimes confounded with the preceding one, is not larger than a woodcock; they breed in immense numbers on the northern coast of Scotland, and the neighbouring islands; whose inhabitants salt them for their winter provision. It is the *Proc. Anglorusis*, Temminck, having the plumage above, black; beneath, white; the sides of the neck freckled black and white.

Navigators occasionally speak of some birds of the Antarctic Seas by the name of Petrels; which may constitute separate genera, such as the PELECANOIDES, Lacepede, which have the bill and figure of the Petrel, and the dilatable throat of the cormorant. Such is the *Proc. urinatrix*, Gmelin, and the *Pachyptila*, Illiger, to which belongs the Blue Petrel, *P. vittata*.

DIOMEDEA, *Linnæus**.

The *Albatross* is the most massive of all aquatic birds. The large, strong, and trenchant bill is marked with sutures, and is terminated by a stout hook which seems to be articulated with it. The nostrils resemble short rolls laid on the sides of the beak; there is no thumb, not even the small nail that is observed in the petrels. They inhabit the South Seas, and feed on mollusca, &c.

D. exulans, Lin., is the species best known to navigators, who, on account of its size, white plumage, and black wings, and because it is particularly common beyond the tropic of Capricorn, have called it *The Cape Sheep*.

The English also style it the *Man of War Bird*, &c. It is the great enemy of the flying-fish. It constructs a high nest of earth, and lays a number of eggs, which are considered good food. The cry of the Albatross is a piping sort of clang, deeper than that of a goose, but something like it.

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* *Diomedea*, the ancient name of certain birds of the Island of Diomedes, near Tarentum, which were said to receive the Greeks favourably, and to attack the barbarians. As to the word *Albatross*, I find that the early Portuguese navigators called the Boobies and other oceanic birds *Alcatros*, or *Alcatrass*.

LARUS, *Linnæus.*

The *Gulls* have a compressed, elongated, pointed bill, the superior mandible



arcuated near the end, and the inferior forming a salient angle beneath. The nostrils, placed near its middle, are long, narrow, and bored quite through; their tail is full, their legs tolerably long, and their thumb short. They are cowardly and voracious birds, which swarm along the sea coasts, feeding on fish, the flesh of dead bodies, &c. They breed in the sand, or in clefts of rock, laying but few eggs. When they fly into the country, bad weather may be expected. They have been divided into GOELANDS, which embraces the Great Black-Backed Gull, *Lar. marinus* and *L. glaucus*, and Mauves or Mouettes, which embraces the smaller species.

Lar. cyanorhynchus, Meyer. (The Common Gull.) When old, of a beautiful white, with a light ash-coloured mantle; the primary quills of the wing partly black, with white spots at their tips, the feet and bill lead-coloured. Feeds on shell fish.

LESTRIS, *Illiger.*

These birds have very properly been separated from the common Gulls. Their membranous nostrils, larger than those of the latter, open nearer to the point and edge of the beak, and their tail pointed. They pursue the small gulls with singular ferocity to rob them of their food, and hence their name.

STERNA, *Linnæus.*

The *Terns*, or *Sea-Swallows*, derive this latter appellation from their



excessively long and pointed wings, and from their forked tail, which render their flight and carriage analogous to those of swallows. Their bill is pointed, compressed, and straight, without curve or projection; the nostrils, placed near its base, are oblong and pierced quite through; the membranes which unite their toes are deeply emarginate, consequently they swim but seldom. They fly over the waves in every direction and with great rapidity, uttering loud cries, and skilfully raising from the surface of the water the mollusca and small fish on which they feed. They also penetrate to the lakes and rivers of the interior. There are several species.

We may also distinguish from the other Terns,

THE NODDIES,

Whose tail is not forked, and is nearly as long as the wings. There is a slight projection under their bill, the first indication of that in the mauves. But one species is known,

St. stolida, Lin. (The Noddy), which is a blackish brown, top of the head whitish. Celebrated for the blundering manner in which it throws itself on vessels.

Rhynchops, *Linnæus.*

The *Skimmers* resemble the terns in their small feet, long wings and forked tail, but are distinguished from all birds by their extraordinary bill, the upper mandible of which is shorter than the other, both being flattened so as to form simple blades, which meet without clasping. Their only mode of feeding is by skimming their aliment from the surface of the water with the lower mandible, which they effect while on the wing. One species only is known.

Rhyn. nigra, Lin. (The Black Skimmer), is white; back, shoulders, and upper part of the body black, a white band on the wing; outside of the external quills of the tail white; bill and feet red; hardly as large as a pigeon. From the vicinity of the Antilles.

FAMILY III.

TOTIPALMATÆ.

The birds of this family are remarkable for having the thumb united with the toes by one single membrane, a mode of organisation that renders their feet complete oars, notwithstanding which, they perch upon trees, being almost the only palmipedes who do so. They all fly well, and have short feet. Linnæus separated them into three genera, the first of which it was necessary to subdivide.



Pelecanus, *Linnæus.*

The *Pelicans* comprise all those in which the base of the bill is found to have some part destitute of feathers. Their nostrils are fissures, the apertures of which are scarcely perceptible. The skin of their throat is more or less extensible, and their tongue very small. Their thin gizzard, with their other stomachs, forms a large sac.



The bill of the true Pelicans is very remarkable for its extreme length, its straight, very broad, and horizontally flattened form, for the hook which terminates it, and for the lower mandible whose flexible branches sustain a naked membrane, susceptible of being dilated into a large sac.

P. onocrotalus, Lin. (The Common Pelican.) As large as a swan, entirely white, slightly tinged with flesh colour; the hook of the bill of a cherry-red; is more or less disseminated throughout the eastern continent, breeds in marshes, and feeds exclusively on living fish. It is said to transport both food and water in its sac.

PHALACROCORAX, *Brisson.*

The *Cormorants** have an elongated and compressed beak, the end of the upper mandible hooked, and that of the lower one truncated; the tongue is very small, and the skin of the throat less dilatable; the nostrils resemble a small unpierced line, and the nail of the middle toe is notched like a saw.

Pel. carbo, Lin. (The Cormorant.) Blackish-brown, undulated with jet black on the back, and mixed with white near the end of the bill and front of the neck; circumference of the throat and the cheeks, white, in the male, which also has a tuft on the occiput. Its size is that of the goose. It breeds in holes among the rocks or upon trees, and lays three or four eggs.

TACHYPETES, *Vieillot.*

The *Frigate Birds* differ from the cormorants in their forked tail and short feet, the membranes of which are deeply emarginated; in an excessive length of wing, and in a bill both of whose mandibles are curved at the point. So powerful are their wings, that they fly to an immense distance from all land, principally between the tropics, darting upon the flying fish and striking the boobies to make them disgorge their prey.

One species only is well known, the *Pelecanus aquilus*, Lin., whose plumage is black, the under part of the throat and neck more or less varied with white, and the bill red. Its wings, when expanded, are said to measure from ten to twelve feet.

SULA, *Brisson.*

The *Boobies*† have a straight, slightly compressed, pointed bill, the point slightly arcuated; its edges are serrated, the teeth inclining backwards; the nostrils are prolonged by a line which extends to near the point. They are called Boobies on account of the excessive stupidity with which they permit themselves to be attacked by men and birds, the frigate birds particularly; which, as already stated, force them to yield up the fish they have captured. The most common is

Pelecanus bassanus, Lin. (The Common Booby.) White; the primary quills of the wings and the feet black; the bill is about six inches long, nearly straight, of a beautiful bluish-grey when alive; they are found from the Tagus to the Gulf of Bothnia; great numbers of them are found on the Bass Rock in the Frith of Forth.

PLOTUS, *Linnæus*‡.

The *Darters* have the body and feet very similar to those of a cormorant; a long neck and small head, with a straight, slender, pointed beak, whose edges

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* *Cormorant*, from *Cormoran*, a corruption of *Corbeau marin*, on account of its black colour. It is, in fact, the Aquatic Crow of Aristotle. *Phalacrocorax* (*Bald Crow*) is the Greek name of this bird, indicated by Pliny, but is not employed by Aristotle.

† *Sula* is the name of the common species at the Feroe Islands.

‡ *Plotus*, or *plautus*, signifies, in Latin, flat-foot.

are denticulated; the eyes and nudity of the face, as in the pelicans; their habits also are similar, perching on trees.

Several species or varieties are known from the hot climates of both continents. They are not larger than the duck, but they have a longer neck.

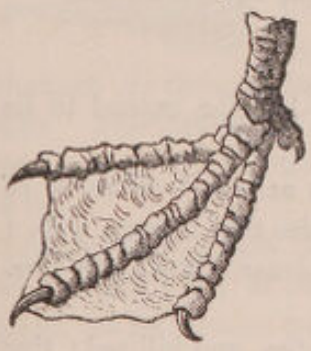
PHÆTON, *Linnæus.*

The *Tropic Birds* are known by two very long and narrow feathers that flow from their tail, which at a distance resemble so many straws. There is no naked part about the head. Their bill is straight, pointed, denticulated, and tolerably strong; their feet short and their wings long: their powers of flight are consequently great, and as they rarely quit the torrid zone, their presence announces to the mariner his vicinity to the tropics. On land, where they seldom resort, except to breed, they perch on trees.

FAMILY IV.

LAMELLIROSTRES.

IN this family we find a thick bill, invested with a soft skin rather than with true horn; its edges are furnished with laminæ or little teeth; the tongue is broad and fleshy, the edges notched. The wings are of a moderate length. The birds comprised in this family pass most of their time in the fresh waters, in which they delight; they feed on small fish, insects, and various other marine productions, which their long neck enables them to seize with facility; some of them dive under water for their prey, where they remain a considerable time.



The great genus

ANAS, *Linnæus,*

Comprises those palmipedes, the edges of whose large and broad bill are furnished with a range of thin salient laminæ, placed transversely, which appear destined to allow the water to pass off when the bird has seized its prey. They are divided into three sub-genera, whose limits, however, are not very precise.



CYGNUS, *Meyer.*

The bill of the *Swans* is of an equal breadth throughout, higher at base than it is wide; the nostrils about the middle of its length; the neck is very long. They are the largest birds of the genus, and feed chiefly on the seeds and roots of aquatic plants. Their intestines and cæca in particular are consequently very long. There is no inflation of the trachea. Two species are found in Europe.

Anas olor, Gm. (The Red-billed or Domestic Swan.) Beak red, edged with black, surmounted at base by a rounded protuberance; the plumage snow-white. When young, the beak is lead-coloured and the plumage grey.

This is the species, when domesticated, that forms the ornament of our ponds and grounds. Its elegance of form, graceful movements, and snow-white plumage have rendered it the emblem of innocence and beauty. It feeds both on fish and vegetables, flies extremely high and with great swiftness, using its wings, which are a powerful weapon, in striking its enemies when attacked. It breeds among the reeds in ponds, and lays six or eight eggs of a greenish-grey.

An. cygnus, Gm. (The black-billed Swan.) Bill black with a yellow base; the body white, tinged with a yellowish grey; when young, all grey.

An. plutonia, Sh. (The Black Swan) has been lately discovered in New Holland; it is the size of the common species, but its carriage is less graceful and elegant; it is all black, the primary quills excepted, which are white, and the bill with the naked skin on its base, which is red.

ANSER, *Brisson.*

Geese have a moderate or short bill, narrower before than behind, and higher than wide at base; their legs, being longer than those of the ducks, and placed nearer the centre of the body, increase their facility in walking. Several of them feed on seeds and plants. There is no inflation at the root of the trachea, nor is there any curve in that organ in any of the species known.

GEESE, *properly so called.*

Have a bill as long as their head; the ends of the lamellæ extend to its edges, appearing like pointed teeth.

An. anser, Lin. (The Common Goose), which has acquired all sorts of colours in our poultry-yards, originates from a wild species that is grey, with a brown mantle undulated with grey and an orange-coloured beak, the *Ans. cinereus*, Meyer.

An. hyperborea, Gm. (The Snow-Goose.) White; feet and bill red; tips of the wing-quills black. It sometimes wanders into the temperate parts of Europe during the prevalence of heavy gales in winter. The young bird is more or less grey.

BERNACLES

Are distinguished from the common Geese by a shorter and slenderer bill, the edges of which conceal the extremities of the laminæ.

An. bernicla, Gm. (The Brant.) The head, neck, and quills of the wings are black, the mantle a brown-grey; a spot on each side of the upper part of the neck, and the under part of the tail, white; the bill black, and feet brown.

An. Ægyptiaca, Gm. (The Egyptian Goose), remarkable for the lustre of its colours and the small spur attached to its wings, also belongs to this subgenus; it is sometimes domesticated, but always retains a propensity to return to its wild state. It is the *Chenalopex* or *Fox-Goose*, held in veneration among the ancient Egyptians on account of its attachment to its young.

ANAS, *Meyer.*

Ducks, properly so called, have the bill broader at base than it is high, and

wider at the end than towards the head; the nostrils nearer to its back and base. Their legs being shorter than those of geese, and placed farther back, renders walking more difficult to them than to the latter.

The species of the first division, or those whose thumb is bordered with a membrane, have a larger head, a shorter neck, the feet placed farther back, smaller wings, a stiffer tail, more compressed tarsi, longer toes, and the membrane of the feet more entire. They walk with more difficulty, feed more exclusively on fish and insects, and dive more frequently.

Ducks are now distributed into various subgenera: such as *Oidemia* (the Scoter, Velvet Duck, Black Duck); *Clangula* (Long-tailed Duck); *Somateria* (Eider Duck); *Fuligula* (Red-head, Pochard Duck, Tufted Duck); *Rhynchaspis* (The Shoveller); and *Tadorna* (The Sheldrake, Muscovy Duck), originally from South America, where it perches on trees, and the *An. boschas*, Lin. (or Mallard), the stock of our common tame Duck, Teal, &c.

Mergus, *Linnæus.*

The genus of the *Merganser*s comprehends those species in which the bill, thinner and more cylindrical than that of the ducks, is armed along its edges with small pointed teeth resembling those of a saw, and directed backwards; the tip of the upper mandible is hooked. Their carriage and even plumage are those of ducks, properly so called; but their gizzard is less muscular. The inflation of the lower larynx in the males is enormous, and partly membranous. They live on lakes and ponds, where they are very destructive to fish.



Merg. Merganser, Lin. (The Goosander.) Is the size of a duck, and has red feet and a bill of the same hue. The head of the old male is of a deep green, the feathers on its summit forming a sort of toupee; the mantle is black, with a white spot over the wing; underneath and the neck slightly tinged with rose-colour.

CLASS III.

REPTILIA.

The disposition of the heart in *Reptiles* is such, that at each contraction, a portion only of the blood it has received from the different parts of the body is transmitted to the lungs, the remainder returning to those parts without having passed through the pulmonary organs, and without having respired.

The result of this is, that the action of oxygen upon the blood is less than in the Mammalia, and that if the quantity of respiration in the latter, in which all the blood is compelled to pass through the

lungs before it returns to the rest of the body, be expressed by a unit, that of Reptiles will be expressed by a fraction of a unit, so much the smaller, as the quantity of blood transmitted to the heart at each contraction is less.

As it is from respiration that the blood derives its heat and the fibre its susceptibility of nervous irritation, the blood of reptiles is cold, and the muscular energy less than that of Quadrupeds, and much less than that of Birds; thus we find their movements usually confined to crawling and swimming; for, though at certain times several of them jump and run with considerable activity, their habits are generally lazy, their digestion excessively slow, and their sensations obtuse. In cold or temperate climates almost all of them pass the winter in a state of torpor. Their brain, which is proportionally very small, is not so essentially requisite to the exercise of their animal and vital faculties, as to the members of the two first classes; their sensations seem to be less referred to a common centre, for they continue to live and to exhibit voluntary motions, long after losing their brain, and even after the loss of their head. A communication with the nervous system is also much less necessary to the contraction of their fibres, and their muscles preserve their irritability after being severed from the body much longer than those of the preceding classes; their heart continues to pulsate for hours after it has been torn away, nor does its loss prevent the body from moving for a long time.

The smallness of the pulmonary vessels permits Reptiles to suspend the process of respiration without arresting the course of the blood; thus they dive with more facility, and remain longer under water than either the Mammalia or Birds.

No Reptile hatches its eggs The young Batrachians, on quitting the egg, have the form and bronchiæ of Fishes, and some of the genera preserve these organs, even after the development of their lungs.

The quantity of respiration in Reptiles is not fixed like that of the Mammalia and Birds, but varies with the proportion of the diameter of the pulmonary artery compared to that of the aorta. Thus Tortoises and Lizards respire more than Frogs, &c.; and hence a much greater difference of sensibility and energy than can exist between one of the Mammalia and another, or between Birds.

The comparison, however, of their quantity of respiration and of their organs of motion, has enabled M. Brongniart to divide them into four orders, viz.

The *Chelonia*, or *Tortoises*, whose heart has two auricles, and whose body, supported by four feet, is enveloped by two plates or bucklers formed by the ribs and sternum.

The *Sauria*, or *Lizards*, whose heart has two auricles, and whose body, supported by four or two feet, is covered with scales.

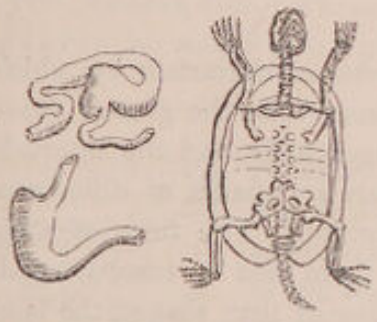
The *Ophidia*, or *Serpents*, whose heart has two auricles, and whose body always remains deprived of feet.

The *Batrachia*, whose heart has but one auricle, and whose body is naked, most of which pass, with age, from the form of a Fish respiring by bronchiæ, to that of a Quadruped breathing by lungs. Some of them, however, always retain their bronchiæ, and a few have never more than two feet.

ORDER I.

CHELONIA.

The *Chelonia*, better known by the name of Tortoises, have a heart composed of two auricles, and of a ventricle divided in two unequal cavities, which communicate with each other.



These animals are distinguished at the first glance by the double shield in which the body is enveloped, and which allows no part to project except their head, neck, tail, and four feet. The shell (or upper shield) is formed by the ribs, of which there are eight pair, widened and reunited by denticulated sutures, and with plates adhering to the annular portion of the dorsal vertebræ, so that all these parts are rendered fixed and immoveable. The inferior shell is formed of pieces, usually nine in number, analogous to a sternum. A frame composed of bony pieces, which has been considered as possessing some analogy with the sternal or cartilaginous portion of the ribs, and which in one subgenus always remains in a cartilaginous state, surrounds the shell, uniting and binding together all the ribs which compose it. The vertebræ of the neck and tail are consequently the only ones which are moveable.

The lungs have considerable extent, and are situated in the same cavity with the other viscera. The thorax in most of them being immoveable, it is by the play of its mouth that the tortoise respires, which it effects by keeping the jaws closed, and alternately raising and depressing the os hyoides. The former of these motions permits air to enter through the nostrils, the tongue then closes the internal orifice of those apertures, when the latter forces the air into the lungs.

Tortoises have no teeth; their jaws are invested with horn like those of birds; the Chelydes excepted, where they are covered with skin only.

They possess great tenacity of life, and instances are on record in which they have been seen to move for several weeks after losing their head. They require

but little nourishment, and can pass whole months and even years without eating.

The chelonia were all united in the genus

Testudo, *Linnæus.*

They have since been divided into five subgenera, chiefly from the forms and teguments of their shell and of their feet.

Testudo, *Brongniart.*

The *Land Tortoises* have the shell arched and supported by a solid bony frame, most of its lateral edges being soldered to the sternum; the legs, as if truncated, with very short toes, which are closely joined as far as the nails, all susceptible of being withdrawn between the bucklers; there are five nails to the fore feet, the hind ones have four, all stout and conical. Several species live on vegetable food.



Emys, *Brongniart.*

The *Fresh-water Tortoises* have no other constant characters by which they can be distinguished from the preceding ones, than the greater separation of the toes, which are terminated by longer nails, and the intervals occupied by membranes; even in this respect there are shades of difference. They likewise have five nails before and four behind. The form of their feet renders their habits more aquatic. Most of them feed on insects, small fishes, &c. Their envelope is generally more flattened than that of the land tortoises.

Among the fresh-water Tortoises we should remark The Box-Tortoises, the sternum of which is divided by a moveable articulation into two lids, which, when the head and limbs are withdrawn, completely encase the animal in its shell.

Chelonia, *Brongniart.*

The envelope of the *Sea Tortoises* is too small to receive their head, and particularly their feet, which are very long (the anterior ones most so), and flattened into fins. The toes are all closely united in the same membrane, the two first ones of each being alone furnished with pointed nails, one or other of which at a certain age is usually lost. The pieces of their sternum do not form a continuous plate, but are variously notched, leaving considerable intervals which are filled with cartilage only. The ribs are narrowed and separated from each other at their external extremities; the circumference of the shell, however, is surrounded with a circle of pieces corresponding to the ribs of the sternum.



Test. mydas, Lin. (The Green Tortoise.) Is distinguished by its greenish plates, thirteen in number, which are not arranged like tiles; those of the middle range are almost regular hexagons. It is found from six to seven feet

long, and weighing from seven to eight hundred pounds. Its flesh is highly esteemed, and furnishes a wholesome and palatable supply of food to the mariner in every latitude of the torrid zone. It feeds in large troops on the sea-weed at the bottom of the ocean, and approaches the mouths of rivers to respire. The eggs, which it deposits in the sand to receive the vivifying influence of the sun, are excellent food; its shell is of no value.

Merrem has recently distinguished, by the name of SPHARGIS, those Cheloniæ whose shell is destitute of plates, and merely covered with a sort of leather. Such is

Test. coriacea, Lin. A very large species of the Mediterranean. Its shell is oval and pointed behind, exhibiting three projecting longitudinal ridges.

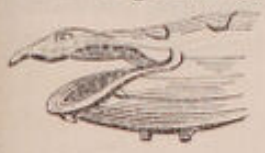
CHELYS, *Dumerii*.

The *Chelydes* resemble fresh-water tortoises in their feet and nails; and their most dominant character consists in their mouth, which opens cross-wise, being unarmed with the horny beak common to the other cheloniæ, and similar to that of certain batrachians, the *pipa* in particular.

Test. fimbria, Gm. The shell studded with pyramidal elevations, and the body edged all round with a pinked fringe. It is found in Guiana.

TRIONYX, *Geoffroy*.

The *Soft-shelled Tortoises* have no scales, the shell and sternum being



simply enveloped by a soft skin; neither of those shells is completely supported by bones, as the ribs do not extend to the edge of the upper one, and are united with each other only for a portion of their length, the parts analogous to the sternal ribs being simple cartilage, and the sternal pieces partially notched as in the sea-tortoises, not covering the whole lower surface. After death the very rough surface of the ribs may be perceived through the dried skin; their feet, like those of the fresh water tortoise, are palmated without being lengthened, but only three of their toes are possessed of nails. The horn of their beak is invested externally with fleshy lips, and their nose is prolonged into a little snout. Their tail is very short. They live in fresh water, and the flexible edges of their shell aid them in swimming.

T. Ægyptiacus, Geoff. (The Tyrse.) This species is sometimes three feet in length, of a green colour spotted with white, its shell but slightly convex. It devours the young crocodiles as soon as they leave the egg, as the following species does the alligators of America, and thus renders important services to Egypt.

Test. ferox, Gm. (The Soft-shelled Tortoise of America) inhabits the rivers of Carolina, Georgia, the Floridas, and of Guiana. It remains in ambush under roots of reeds, &c., whence it seizes birds, reptiles, &c., devours the young alligators, and is devoured in turn by the old ones. Its flesh is highly esteemed.

ORDER II.

SAURIA*.

The *Saurians* have a heart like that of the chelonia, composed of two auricles and a ventricle, sometimes divided by imperfect partitions.



Their ribs are moveable, partly connected with the sternum, and rise and fall in respiration.

Their lungs extend more or less towards the posterior extremity of the body; it frequently penetrates very far into the lower part of the abdomen, whose transverse muscles pass under the ribs, and even towards the neck, to clasp it. Those in which this organ is very large, possess the singular faculty of changing the colours of their skin according to the excitement produced in them by their wants or passions.

Their eggs are enveloped by a covering more or less hard, and the young always retain the form in which they quit them.

Their mouth is always armed with teeth, and their toes, with very few exceptions, are furnished with nails; their skin is covered with scales, more or less compact, or at least with scaly granules. They all have a tail more or less long, and generally very thick at base; most of them have four legs, a few only having but two.

FAMILY I.

CROCODILIDA.

This family contains the single genus

Crocodilus, *Brisson.*

Crocodiles are large animals, with a tail flattened on the sides, five toes before and four behind, of which only the three internal ones on each foot are armed with nails, all more or less united by membranes; a single range of pointed teeth in each jaw; the tongue fleshy, flat, and adhering close to its edges; a circumstance which induced the ancients to believe that they had none; the back and tail covered with very stout, large, square scales or plates, relieved by a ridge along their middle; a deeply notched crest on the tail, which is double at its base. The plates on the belly are smooth, thin, and square. Their





* From σαυρος, Lizard, animals analogous to Lizards.

nostrils, which open on the end of the muzzle by two small crescent-shaped fissures closed by valves, communicate with the extremity of the hind part of the mouth, by a narrow canal which traverses the palatine and sphenoidal bones.

The lower jaw being continued behind the cranium, the upper one appears to be moveable, and has been so described by the ancients; it only moves, however, with the entire head.

They have the power of closing the external ear by means of two fleshy lips, and there are three lids to their eyes.

The vertebræ of the neck rest on each other through the medium of small false ribs, which renders all lateral motion difficult, and does not allow these animals to deviate suddenly from their course; consequently it is easy to escape from them by pursuing a zig-zag direction, or by running round them.

Their eggs are as large and hard as those of a goose; the females keep careful watch over them, and tenderly protect their young for some months. They inhabit fresh water, are extremely ferocious and carnivorous, cannot swallow under water, but drown their prey, and place it in some submerged crevice of a rock, where they allow it to putrefy before they eat it.

The species, which are more numerous than they were thought to be previous to my observations, are referable to three distinct subgenera, viz. GAVIALS, true CROCODILES, and ALLIGATORS. To the latter belongs

Croc. lucius, Cuv. It inhabits the southern parts of North America, forces itself into the mud in severe winters, and remains torpid. The female deposits her eggs in alternate layers with beds of earth.

FAMILY II.

LACERTINIDA*.

THIS family is distinguished by the tongue, which is thin, extensible, and terminates in two threads, like that of the coluber and viper; the body is elongated; the gait rapid; each foot has five toes, separate and unequal, the hind ones particularly so, all armed with nails; the scales on the belly and round the tail are arranged in transverse and parallel bands; the tympanum is level with the head, or but slightly sunk and membranous. A production of the skin with a longitudinal slit which is closed by a sphincter, protects the eye, under whose anterior angle is the vestige of a third eye-lid; the false ribs do not form a complete circle.

The species being very numerous and various, we subdivide them into two great genera.

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* *Lacerta*, a Lizard.

Monitor.

This genus contains species of the largest size; they have two teeth in both jaws, but none in the palate; the greater number are recognised by their laterally compressed tail, which renders them more aquatic. The vicinity of water sometimes brings them in the neighbourhood of crocodiles and alligators, and it is said that by whistling they give notice of the approach of these dangerous animals. This report is most probably the origin of the term *Sauvegarde* or *Monitor* applied to some of their species, but the fact is very uncertain.

Lac. nilotica, Lin. Strong conical teeth, the posterior of which become rounded by age; brown, with pale and deeper coloured dots, forming various compartments, among which we observe transverse rows of large oscellated spots that become rings on the tail. It attains a length of five and six feet. The Egyptians pretend it is a young crocodile hatched in a dry place. It was engraved upon the monuments of that country by its ancient inhabitants, and possibly, because it devours the eggs of the crocodile.

Lacerta, properly so called,

Or *true Lizards*, form the second genus of the Lacertians. The extremity of their palate is armed with two rows of teeth, and they are otherwise distinguished by a collar under the neck, formed of a transverse row of large scales, separated from those on the belly by a space covered with small ones only, like those under the throat; and by the circumstance that a part of the cranium projects over their temples and orbits, so as to furnish the whole top of the head with a bony buckler. They are very numerous.

FAMILY III.

IGUANIDA.

This third great family of Saurians possesses the general form, long tail, and free and unequal toes of the Lacertians; their eye, ear, &c., are also similar, but their tongue is fleshy, thick, non-extensible, and only emarginated at the tip.



They may be divided into two sections; in the first, or that of the Agamians, there are no palatine teeth. In this section we place the following genera.

Stellio, *Cuvier*.

In addition to the general characters of the family of the Iguanida, the tail is encircled by rings composed of large and frequently spiny scales. It is divided by naturalists into various subgenera.

Agama, *Daudin.*

The *Agamæ* bear a great resemblance to the common Stellios, particularly in their inflated head; but the scales of their tail, which are imbricate and not verticillate, distinguish them from that genus. Their maxillary teeth are nearly similar, and there are none in the palate. This genus is also divided into various subgenera.

Istiurus, *Cuvier.*

The distinguishing character of this genus consists in an elevated and trenchant crest, which extends along a part of the tail, and which is supported by high spinous apophyses of the vertebræ; this crest is scaly like the rest of the body; the scales on the belly and tail are small, and approach somewhat to a square form; the teeth are strong, compressed, and without denticulations: there are none in the palate: there is a series of femoral pores. The skin of the throat is smooth and lax, but without forming a dewlap.

Draco, *Linnæus**.

The *Dragons* are distinguished at the first glance, from all other Saurians, by their first six false ribs, which, instead of encircling the abdomen, extend outwards in a straight line, and support a production of the skin, forming a kind of wing that may be compared to that of a bat, but which is not connected with the four feet; it acts like a parachute in supporting them, when they leap from one branch to another, but has not sufficient power to enable them to rise like a bird. They are small animals, completely invested with little imbricated scales, of which those on the tail and limbs are carinated. Their tongue is fleshy, but slightly extensible, and somewhat emarginate. A long pointed dewlap hangs under their throat. All the known species are from the East Indies.

It is perhaps to this tribe of *agamians*, that we should approximate a very extraordinary reptile, which is only to be found among the fossils of the old Jura limestone formation.

Pterodactylus, *Cuvier.*

It had a short tail, an extremely long neck, and a very large head; the jaws armed with equal and pointed teeth; but its chief character consisted in the excessive elongation of the second toe of the fore-foot, which was more than double the length of the trunk, and most probably served to support some membrane which enabled the animal to fly, like that upheld by the ribs of the dragon.

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* The term δρακων, *draco*, generally designated a large serpent; *Dragons*, with a crest or beard, are spoken of by ancient writers, a description which can only apply to the *Iguana*; Lucian is the first who mentions *Flying Dragons*, alluding, no doubt, to the pretended Flying Serpents treated of by Herodotus. St. Augustine, and other subsequent authors, ever after described Dragons as having wings.

The second section of the Iguanian family, that of the IGUANIANS *proper*, is distinguished from the first by having teeth in the palate.

IGUANA, *Cuvier.*

In *Iguanæ*, properly so called, the body and tail are covered with small imbricated scales; along the entire length of the back is a range of spines, or rather of recurved, compressed, and pointed scales; beneath the throat a pendent compressed dewlap, the edge of which is supported by a cartilaginous process of the hyoid bone; a series of porous tubercles on their thighs as in the true lizards; the head covered with plates. Each jaw is surrounded with a row of compressed triangular teeth, whose cutting edge is denticulate; two small rows of the same on the posterior edge of the palate.

Ig. tuberculata, Laur. (The Common American Iguana.) Yellowish green above, marbled with pure green; the tail annulated with brown, &c.; from four to five feet in length, and common in South America, where its flesh is esteemed delicious, although unwholesome. It lives mostly on trees, occasionally visits the water, and feeds on fruit, grain, and leaves; the female lays her eggs in the sand; they are the size of those of a pigeon, agreeable to the taste, and almost without white.

The remaining genera are *Ophyressa*, *Basiliscus*, *Polychrus*, *Echphimotus*, *Oplurus*, and *Anolius*, the last of which is remarkable for the skin of the toes, which is spread out into a disk, that enables them to cling to various surfaces.

It is to this family of the Iguanæ with palatine teeth, that belongs an enormous fossil reptile, known by the name of the *Maestricht Animal*, and for which the new name of MOSASAURUS has recently been coined.

FAMILY IV.

GECKOTIDA.

THIS family is composed of nocturnal Lizards, which are so similar, that they may be left in one genus.

GECKO, *Daudin**.—ASKALABOTES, *Cuvier.*

The *Geckos* are Saurians, which do not possess the elongated graceful form of those of which we have hitherto spoken; but, on the contrary, are flattened, the head particularly. Their feet are moderate, and the toes almost equal;

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* *Gecko*, a name given to a species in India, in imitation of its cry, just as another one is termed *Tockaie* at Siam, and a third *Geitje* at the Cape; ασκαλαβωτης, the Greek name of the Geckotte.—*Lacepede.*

their gait is a heavy kind of crawling; very large eyes, and the pupil becomes narrow at the approach of light, like that of a cat, rendering them nocturnal animals, which secrete themselves during the day in dark places. Their very short eye-lids are completely withdrawn between the eye and the orbit, which gives them a different aspect from other Saurians. Their tongue is fleshy and non-extensible; their tympanum somewhat sunk; their jaws everywhere furnished with a range of very small closely-jointed teeth; their palate without teeth; their skin is studded above with very small granular scales, among which are often found larger tubercles, and beneath, covered with scales somewhat smaller, which are flat and imbricated.

This genus is numerous and disseminated throughout the warm portions of both continents. The melancholy and heavy air of the Gecko, superadded to a certain resemblance it bears to the salamander and the toad, have rendered it the object of hatred, and caused it to be considered as venomous, but of this there is no real proof.



The toes of most of them are widened along the whole or part of their length, and furnished beneath with regular plaits of skin, which enable them to adhere so closely, that they are sometimes seen crawling along ceilings. Their nails are retractile, and preserve their point and edge.

They are now divided into the *Platidactyli, Hemidactyli, Thecadactyli*, &c. &c., according to the different arrangement of the toes. The

Platydactyli

Are the most numerous, and have the toes widened throughout, and covered beneath with transverse scales. They are a beautiful species, painted in the most lively colours, and from the Mauritius.

In some the femoral pores are deficient. To this division Mr. Grey gives the name of Platydactylus. In others the pores are strongly marked; of these Mr. Grey has made his genus Phelsuma. They are considered very venomous at the Cape; others have no nail to their thumb, nor to the second and fifth toes of all the feet: these form the Tarentola of Grey. In the

Hemidactyli,

The base of the toes are furnished with an oval disk, formed beneath a double row of scales, from the middle of which rises the second phalanx, which is slender, and has the nail at its extremity; one species of this division is found in the south of Europe, another in the hot parts of America, and two others in India. The

Thecadactyli

Have the toes widened throughout, and furnished beneath with transverse scales, divided by a deep longitudinal furrow, in which the nail is concealed. The fourth division, or

PTYODACTYLI,

Have the ends of the toes dilated into plates, the under surface striated, so as to resemble a fan; each toe has a strongly-hooked nail. In some, the toes are free and the tail round.

We are compelled to establish

FAMILY V.

CHAMÆLEONIDA,

FOR the single genus,

CHAMÆLEO*,

Or the *Chameleons*, which is very distinct from all other Saurian genera; and indeed there is some difficulty in introducing them.

Their skin is roughened by scaly granules, their body compressed, and the back—if we may so express it—trenchant; tail round and prehensile; five toes to each foot, but divided into two bundles, one containing two, the other three, each bundle being united by the skin down to the nails; the tongue fleshy, cylindrical, and susceptible of great extension; teeth trilobate; eyes large, but nearly covered by the skin, except a small hole opposite to the pupil, and possessing the faculty of moving independently of each other; no visible external ear, and the occiput pyramidically elevated. Their first ribs are joined to the sternum; the following ones are extended each to its fellow on the opposite side, so as to inclose the abdomen by an entire circle. Their lungs are so enormous, that when inflated, their body seems to be transparent, a circumstance which induced the ancients to believe that they fed on air. They live on insects, which they capture with the viscid extremity of their tongue, the only part of their body which seems to be endowed with quickness of motion, as in every thing else they are remarkable for their excessive slowness. The great extent of their lungs is probably the cause of their faculty of changing colour, which takes place, not as is thought in conformity with the hue of the bodies on which they rest, but according to their wants and passions. Their lungs, in fact, render them more or less transparent, compel the blood in a greater or less degree to return to the skin, and even colour that fluid more or less vividly in proportion to the quantity of air they contain. They always remain on trees.





Lac. africana, Gm. (The Common Chameleon.) The hood pointed and relieved by a ridge in front; the granules on the skin equal and close; the

* Χαμαιλεων (Little Lion), the Grecian name of this animal. Aristotle, who uses it, has also given an excellent description of it. Hist. An. lib. II. cap. ix.

superior crest indented as far as half the length of the back, the inferior one to the anus. The hood of the female does not project so much, and the denticulations of her crest are smaller. From Egypt, Barbary, and even the south of Spain, and India. Six other species are described.

FAMILY VI.

SCINCOIDEA.

The Scincoideans are known by their short feet, non-extensible tongue, and the equal scales which cover the body and tail, like tiles.

Scincus, *Daudin.*

Four short feet; the body and tail almost one continued and uniform piece; no enlargement of the occiput; without crest or dewlap, and covered with uniform, shining scales, arranged like tiles, or those of a carp. Some of them are fusiform; others, more or less elongated, resemble serpents, the *Anguis* particularly, to which they are related by several internal affinities, and which they connect with the family of the Iguanida, by an uninterrupted suite of transitions. Their tongue is fleshy, but slightly extensible and emarginate; the jaws every where furnished with small, closely set teeth. In the eye, ear, &c., they bear a greater or less resemblance to the iguanæ and lizards; the feet are furnished with free and unguiculated toes.

The French Antilles produce several species; the Moluccas and New Holland also produce some species remarkable for their thickness—the whole division, however, are badly characterised.

Seps, *Daudin.*

Seps only differs from Scincus in the more elongated body, which is exactly similar to that of an Anguis, and in the still smaller feet, the two pairs of which are further apart. Their lungs begin to exhibit some inequality.

Bipes, *Lacepede.*

A small genus, only differing from Seps in the entire absence of fore feet, having the scapulæ and clavicles concealed beneath the skin, the hind feet alone being visible. There is but a step from it to *Anguis.*

Chalcides, *Daudin.*

Elongated *Lizards* resembling serpents; but the scales, instead of being arranged like tiles, are rectangular, forming transverse bands, which do not encroach on each other like those on the tails of ordinary lizards.

Chirotes, *Cuvier.*

Similar to Chalcides in their verticillate scales, and still more so to the Amphisbænæ in the obtuse form of their head; but distinguished from the former by the absence of hind feet, and from the latter by the presence of the anterior feet. One species only is known, which is found in Mexico.

ORDER III.

OPHIDIA*.

Serpents are reptiles without feet, and consequently those which best merit that appellation. Their extremely elongated body moves by means of the folds it forms when in contact with the ground. They are divided into three families.

FAMILY I.

ANGUINA†.

The *Angues* still have an osseous head, teeth, and tongue, similar to those of the Seps; their eye is furnished with three lids, &c., and, in fact, if we may so express it, they are Seps without feet; they are all comprised in the genus

Anguis, *Linnæus,*

Characterised externally by imbricated scales, with which they are completely enveloped. They have been separated into four subgenera; in the three first we still find beneath the skin the bones of the shoulder and pelvis. In the *Pseudopus* (Merr.) the tympanum is visible externally, and on each side of the anus is a small prominence containing a bone analogous to the femur; one of the lungs is a fourth smaller than the other; the scales are square, thick, and semi-imbricate. The *Ophisaurus,* (Daudin), only differs from the above in being entirely deficient in external posterior extremities.



This genus is now subdivided into *Pseudopus, Ophisaurus, Anguis proper,* and *Acontias.*

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* Ὄφις, a Serpent.

† *Anguis,* the Latin generic term for Serpents.

FAMILY II.

SERPENTIA.

The *true Serpents*, which are by far the most numerous, comprise the genera without a sternum, and in which there is no vestige of a shoulder, but where the ribs still surround a great part of the circumference of the trunk, and where the body of each vertebra is still articulated by a convex surface to a cavity in the succeeding one. The third eye-lid and the tympanum are deficient; but the malleus of the ear exists under the skin, and its handle passed behind the tympanum. There is still a vestige of a posterior limb, concealed under the skin, in several of this family, and which in some of them shows its extremity externally in the form of a small hook. We subdivide them into two tribes.



That of the Amphisbænæ, as in the preceding reptiles, still has the lower jaw supported by a tympanal bone directly articulated with the cranium, the two branches of this jaw soldered together in front, and those of the upper one fixed to the cranium and to the intermaxillary bone, circumstances which prevent that dilatation of the mouth which obtains in the succeeding tribe, and which occasions a uniformity of the head and body, a form which enables them to move backwards or forwards with equal facility. The bony frame of the orbit is incomplete behind, and the eye very small; the body is covered with scales, the trachea long, and the heart very far back. They are not venomous.



They form two genera, one of which is allied to Chalcides and Chirotes, and the other to Anguis and Acontias.

Amphisbæna, *Linnæus**.

The whole body surrounded with circular ranges of quadrangular scales, like the Chalcydes and the Chirotes among the Saurians; a few conical teeth in the jaws, but none in the palate. There is but one lung.

Two species have long been known, *Amph. alba*, Lacep., and *Amph. fuliginosa*, Lin. both from South America. They feed on insects, and are often found in ant-hills, which has occasioned a belief among the people that the large ants are their purveyors. They are oviparous.

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* From αμφις and βαινω, walking both ways. The ancients attributed two heads to it.

Typhlops, *Schneider**.

The body covered with small imbricated scales like the Anguis, with which they were long classed; the projecting muzzle furnished with plates; tongue long and forked; the eye resembling a point hardly visible through the skin; one of the lungs four times larger than the other. They are small serpents, at the first glance resembling earth-worms; they are found in the hot portions of both continents.

In the second tribe, that of the Serpentes, or *Serpents properly so called*, the



tympanal bone or pedicle of the lower jaw is moveable, and is itself always suspended to another bone, analogous to the mastoid process, attached to the cranium by muscles and ligaments, which allow it some motion. The branches of this jaw are not so closely united with each other, and those of the upper one are merely connected with the intermaxillary bone by ligaments, so that they can separate to a greater or less extent, which enables these animals so to dilate their mouths as to swallow bodies larger than themselves.

Their palatine arches participate in this facility of motion, and are armed with sharp-pointed teeth which curve backwards, the most predominant and constant character of the tribe. Their trachea is very long, their heart very far back, and most of them have but one large lung with a vestige of another.

Serpents are divided into venomous and non-venomous; and the former are subdivided into such as are venomous with several maxillary teeth, and those which are venomous with insulated fangs.

In such as are not venomous, the branches of the upper jaw as well as those of the lower one, and the palatine arches, are everywhere furnished with fixed and solid teeth; there are then four equal rows of these teeth in the upper part of the mouth, and two below.

Tortrix, *Oppel*,

Distinguished from Anguina, even externally, inasmuch as the scales which form the range along the belly and under part of the tail are a little larger than the others, and the tail itself is extremely short. They have but one lung.

In those non-venomous serpents, on the contrary, where the mastoid bones are detached, and the jaws are susceptible of great dilatation, the occiput is more or less enlarged, and the tongue forked and very extensible.

They have long been divided into two principal genera, Boa and Coluber, distinguished by the simple or double plates on the under part of the tail. The genus

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* Τύφλωψ, τυφλίνη, blind, were the names of the Anguis (slow worm) among the Greeks.

Boa, *Linnæus**,

Formerly comprised all those serpents, venomous or not, the under part of whose body and tail is furnished with uninterrupted transverse scaly bands, and which have neither spur nor rattle at the end of the tail. As they are rather numerous, even after deducting the venomous species, the others have been again subdivided.

The Boa, properly so called, has a compressed body, thickest in the middle, a prehensile tail, and small scales on the head, at least on its posterior portion. It is in this genus that are found the largest serpents on the globe; certain species attain a length of thirty or forty feet, preying on dogs, deer, and even oxen, which they manage to swallow entire, after having crushed them in their folds, and covered them with saliva. This operation requires much time, and an enormous dilatation of their jaws and throat. Their small lung is but half the length of the other.

Boa constrictor, Lin. Known by a broad chain, which extends along the back, formed alternately by large, blackish, irregular hexagonal spots, and by pale oval ones, the two ends of which are emarginate.

The celebrated *Anaconda* is a true Boa.

Coluber, *Linnæus*.

This genus comprises all those serpents, venomous or not, whose sub-caudal plates are divided in two, that is, which are arranged by pairs. Independently of the subtraction of the venomous species, their number is so enormously great, that naturalists have had recourse to all sorts of characters to subdivide them. In the subgenus *Python* we find the *Col. javaniacus*, Sh., which has been found thirty feet in length. Found in the Sunda Islands.

Serpents which are venomous par excellence, or those with isolated fangs, have their organs of manducation constructed on a very peculiar plan.

Their superior maxillary bones are very small, attached to a long pedicle, analogous to the external pterygoid apophysis of the sphenoid bone, and are very moveable; in them is fixed a sharp-pointed pervious tooth, through which flows a liquor secreted by a large gland, situated under the eye. It is this liquor which, poured into the wound made by the tooth, produces effects, more or less violent, according to the species of the reptile in which it is secreted. This tooth, when the animal does not wish to use it, is concealed in a fold of the gum, and behind it are several germs destined to replace it, in the event of its being broken in a wound. These venomous teeth have been termed by

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* *Boa*, the name of certain Italian Serpents of great size, most probably the four striped Coluber, or "Serpent of Epidauras" of the Latins. Pliny says they were thus named, because they sucked the teats of cows. The Boa, 120 feet long, which it is pretended was killed in Africa by the army of Regulus, was probably a Python. See Pliny, lib. viii. cap. xiv

naturalists moveable fangs, but in fact it is the maxillary bone which moves; there are no other teeth in it, so that in this kind of dangerous serpent only the two rows of palatine teeth are to be seen in the upper part of the mouth.

All these venomous species, whose mode of production is well known, bring forth living young ones, as their eggs are hatched without being laid, from which circumstance is derived their common name of *vipers*, a contraction of viviparous.

Venomous serpents with isolated fangs have external characters very similar to those of the preceding ones, but in the greater number the jaws are very dilatable, and the tongue very extensible. The posterior portion of their head being broad, generally gives them a ferocious aspect, which is a partial indication of their disposition. They form two great genera, CROTALUS and VIPERA, the second of which has been variously subdivided, and some smaller ones which group around them.

CROTALUS, *Linnæus.*

Rattlesnakes are pre-eminently conspicuous for the intensity of their venom.



As in the Boa, there are transverse simple plates under the body and tail; but their most distinguishing character is the rattle which terminates the tail. It is formed by several scaly cornets loosely fitted into each other, which move and produce the peculiar noise from which they receive their name whenever they crawl or shake that part of the body. The number of these cornets increases with age, an additional one being always found after each moult. There is a little round indentation or pit behind each nostril. All the species whose habitat is well ascertained are from America. The danger resulting from the bite of these noxious reptiles is in proportion to the warmth of the climate or of the season; their natural disposition, however, is tranquil, and they are rather slow and heavy in their motions, never biting unless provoked, or to kill the prey on which they feed.

Their principal food consists of birds, squirrels, &c. It has long been supposed that it possesses the faculty of rendering them powerless by its breath, or even of *charming* them, as it is called, by which they are compelled to leap into his mouth; this, however, is not so, and the reptile in question seizes its prey while under the agitation and terror produced by its appearance.

In most of the species there are scales on the head similar to those on the back.

The *C. horridus* or the *Diamond Rattlesnake*, the *C. durissus* or the *Banded Rattlesnake*, and the *C. miliaris* or the *Ground Rattlesnake*, a smaller species, but the most dangerous of the three, all inhabit the United States. The most common is the *durissus*; the *miliaris*, although furnished like the others with an apparatus of three or four cornets at the end of the tail, can make no noise with them. The plates on the head are arranged as in the genus Coluber.

VIPERA, *Daudin.*

The vipers, most of which were confounded with the Colubers by Linnæus, on account of their double sub-caudal plates, require to be separated from them from the circumstance of their having poisonous fangs. There are also some serpents which naturally belong to this division, whose sub-caudal plates are either wholly are partially simple. They are all distinguished from the Rattle-snakes by the absence of the pits behind the nostrils.

Vip. brachyura, Cuv. (The Minute Viper.) The intensity and activity of its poison renders it one of the most terrible of the genus. The genus of the vipers is now variously subdivided. To one of these subgenera, NAIA, belongs the celebrated

Col. haje, L. Greenish bordered with brownish. The jugglers of Egypt, by pressing on the nape of the neck with their finger, throw it into a kind of catalepsy which renders it stiff and immoveable, or turns it into a rod, as they term it. Its habit of raising itself up when approached, induced the ancient Egyptians to believe that it was the guardian of the fields it inhabited. They made it the emblem of the protecting divinity of the world, and sculptured it on each side of a globe upon the gates of their temples. It is indubitably the serpent described by the ancients under the name of the *Asp of Egypt*, *Asp of Cleopatra*, &c.

In addition to these two tribes of Serpents, properly so styled, a third has lately been recognised, in which the organisation and armature of the jaws are nearly the same as in the non-venomous serpents, but where the first maxillary tooth, larger than the others, is perforated for the transmission of the poison, as in the venomous serpents with isolated fangs.

These Serpents form two genera, BUNGARUS and HYDRUS, distinguished, like those of the two neighbouring families, by the covering of the abdomen and the under part of the tail.

FAMILY III.

NUDA.

OUR third and last family of the Ophidians, that of the *Naked Serpents*, consists of but one very singular genus, which several naturalists have thought fit to refer to the Batrachians, although we are ignorant as to the fact of its undergoing any metamorphosis. It is the CÆCILIA, *Linneus* *. So called because its eyes, excessively small,



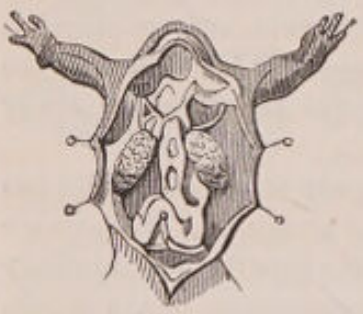
* *Cæcilia*, from τυφλωψ, is the Latin name of the Slow-worm (Orvet,) which in several parts of Europe is still called *blind*, although it has very fine eyes.

are nearly hidden beneath the skin, and sometimes are wanting. The skin is smooth, viscous, and furrowed by annular plaits or wrinkles; it is apparently naked, but on dissection we find in its thickness perfectly formed, though delicate, scales, regularly arranged in several transverse rows between the folds of the skin; a fact ascertained in the *C. glutinosa;* the head of which is depressed; the ribs much too short to surround the trunk; the articulation of the bodies of their vertebræ is effected by hollow conical facets filled with a gelatinous cartilage, as in fishes, and in some of the Batrachians with vegetable matter; earth and sand are also found in their intestines.

ORDER IV.

BATRACHIA *.

The *Batrachians* have a heart composed of but one auricle and one ventricle.



They all have two equal lungs, to which at first are added branchiæ, that have some affinity with those of fishes, and which have cartilaginous arches on each side of the neck attached to the hyoid bone. Most of them lose these branchiæ, and the apparatus which supports them, when they attain a state of maturity. Three genera only, Siren, Proteus, and Menobranchus, retain them for life.

As long as these branchiæ remain, the aorta is divided at its origin into as many branches on each side as there are branchiæ. The branchial blood is brought back by veins which unite near the back in one arterial trunk, as in fishes. It is from this trunk, or immediately from the veins which form it, that arise most of the arteries which nourish the body, and even those which conduct the blood to be oxygenated in the lungs.

In those species, however, which lose their branchiæ, the attendant arteries are obliterated, with the exception of two, which unite in a dorsal artery, giving, each, a small branch to the lungs. It is the circulation of a fish metamorphosed into that of a reptile. Batrachians have neither scales nor shell; a naked skin invests their body, and, one genus excepted, they have no nails.

The envelope of the ova is membraneous. The eggs become greatly enlarged in the water. The young not only differ from the adult in the presence of the branchiæ; but their feet are developed by degrees, and several species have a beak and tail, which they subsequently lose, and intestines of a different form.

Some species are viviparous.

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* From βατραχος (Frog), analogous to Frogs.

RANA, *Linnæus.*

Frogs have four legs in their perfect state, but no tail. Their head is flat, muzzle rounded, and the opening of their jaws large; the tongue, in most of them, is soft, and not attached to the bottom of the gullet, but to the edges of the jaw, and folds inwards. There are but four toes to the anterior feet; the hind ones frequently exhibit the rudiment of a sixth.



There are no ribs to their skeleton, and a prominent cartilaginous plate supplies the place of a tympanum, and renders the ear visible externally. The eye is furnished with two fleshy lids, and a third, which is transparent and horizontal, concealed under the lower one. Inspiration is effected by the muscles of the throat, which, by dilating, receives air from the nostrils, and by contracting while the nostrils are closed by the tongue, compel the air to enter the lungs; expiration on the contrary is produced by the muscles of the lower part of the abdomen. The young frog, which is called a tadpole, is at first furnished with a long fleshy tail, and a small horny beak, having no other apparent limbs than little fringes on the side of the neck. These disappear in a few days, and the hind feet of the tadpole are very gradually and visibly developed; the fore feet are also developed, but under the skin, through which they subsequently penetrate. The tail is gradually absorbed. The beak falls and discloses the true jaws, which at first were soft and concealed beneath the skin; and the branchiæ are annihilated, leaving to the lungs alone the function of respiration in which they participated. The eyes, which at first could only be discerned through a transparent spot in the skin of the tadpole, are now visible with their three lids. Tadpoles reproduce their limbs almost like salamanders.

The period at which each of these changes takes place varies with the species. In cold and temperate climates, the perfect animal passes the winter under ground, or in the mud under water, without eating or breathing, though if we prevent it from respiring during the summer for a few minutes by keeping its mouth open, it dies.

HYLA, *Laurent.*

Tree-Frogs only differ from frogs in the extremities of their toes, each of which is expanded into a round, viscous pallet, that enables them to adhere to the surface of bodies and to climb trees, where in fact they remain all summer, living upon insects. They spawn, however, in water, and enter the mud in water like other frogs. There is a pouch under the throat of the male, which dilates whenever he cries.

Rana arborea, L. (The common Tree-Frog). Green above, pale beneath; a black and yellow line along each side of the body. They are adult in four years. The tadpole completes its metamorphosis in the month of August.

Bufo, *Laurent.*

Toads have a thick bulky body, covered with warts or papillæ; a thick lump behind the ears, pierced with pores, from which issues a milky and fetid humour; no teeth; the hind feet but slightly elongated. They leap badly, and generally avoid the water. They are hideous and disgusting animals, whose bite, saliva, &c. are considered, though erroneously, as poisonous.

There are now several subgenera, such as *Rhinellus, Otilophis, Pipa,* &c.

Salamandra, *Brongniart.*

Salamanders have an elongated body, four feet, and a long tail, which gives them the general form of lizards, with which Linnæus placed them: but they have all the characters of Batrachians.

In their adult state, respiration is performed as in frogs and tortoises. Their tadpoles at first breathe by means of branchiæ, resembling tufts, three on each side of the neck, which are subsequently obliterated; they are suspended to cartilaginous arches, vestiges of which remain in the hyoid bone of the adult. A membranous operculum covers these openings, but the tufts are never inclosed by a tunic, and always float externally. The fore feet are developed before the hind ones; the toes appear successively in the first and the last.

Salamandra, *Laurent.*

The *terrestrial Salamanders,* in a perfect state, have a round tail, and inhabit the water only during their tadpole condition, which is but a short period, or when the female is ready to bring forth. The eggs are hatched in the oviduct.

Triton, *Laurent.*

Aquatic Salamanders always retain the vertically compressed tail, and pass nearly the whole of their existence in the water. The experiments of Spallanzani on their astonishing power of reproduction, have rendered them celebrated. If a limb be amputated, another is reproduced in its stead, with all its bones, muscles, vessels, &c., and this takes place several times in succession. Another not less singular faculty, discovered by Dufay, is the power they possess of remaining inclosed in ice for a considerable time without perishing.

Skeletons of a Salamander, three feet in length, have been discovered among the schist of Œningen. One of them is the pretended *Fossil Man* of Scheucher.

Immediately after the Salamanders come several very similar animals, some of which are considered as having been always destitute of branchiæ, that is, they probably lose them at as early a period as our terrrestrial Salamanders; the others, on the contrary, retain them for life: a circumstance, however, which does not prevent their having lungs like the Batrachians, so that they may be considered as the only vertebrate animals which are truly amphibious.

The former (those in which no branchiæ are visible) constitute two genera.

MENOPOMA, *Harlan.*

Form of a Salamander; eyes apparent, the feet well developed, and an orifice on each side of the neck. Besides the range of small maxillary teeth, there is a parallel row of them on the front of the palate. Such is the reptile termed

Sal. gigantea, Barton. (The Hellbender). From fifteen to eighteen inches long; a blackish blue; inhabits the lakes and the rivers of the interior of North America.

AMPHIUMA, *Garden.*

An orifice on each side of the neck, but the body excessively elongated; the legs and feet, on the contrary, but very slightly developed; the palatine teeth form two longitudinal ranges.

Among those which always retain their branchiæ, the

AXOLOTUS

Is in every respect similar to the larva of an aquatic salamander, having four toes before, five behind, three long tufted branchiæ, &c. The maxillary teeth are like velvet, and those on the vomer in two bands.

MENOBRANCHUS, *Harlan.*

But four toes to all the feet; a range of teeth in the intermaxillaries, and another, parallel, but more extended, in the maxillaries.

The species most known, *Menobranchus lateralis*, Harl. *Tritton lateralis*, Say, inhabits the great lakes of North America, attaining, as it is said, the length of two and three feet. It was first obtained from Lake Champlain.

PROTEUS. *Laurent,*

But three toes before, and only two behind.

Hitherto but a single species has been discovered, *Proteus anguinus*, Laur. More than a foot long, about the thickness of a finger, with a vertically compressed tail and four small legs.

Finally, there are some which are possessed of fore feet only, the hind ones being entirely deficient. They form the genus

SIREN, *Linnæus*

Sirens are elongated animals, almost anguilliform, with three branchial tufts; they have no hind feet, nor is there even a vestige of a pelvis. Their head is depressed, the opening of their mouth small, their muzzle obtuse, eye very small, and ear concealed; the lower jaw is armed with teeth all round, and there are none in the upper one, but there are several rows of them adhering to two plates fixed under each side of the palate.

S. lacertina, Lin. Blackish, and attains the length of three feet; four toes to each foot; tail compressed into an obtuse fin. It inhabits the marshes of Carolina, the rice swamps particularly, where it lives in the mud, occasionally going on shore or into the water. It feeds on lumbrici, insects, &c. There are two much smaller species.

CLASS IV.

PISCES.

The class of *Fishes* is composed of oviparous vertebrata with a double circulation, but in which respiration is altogether effected through the medium of water. For this purpose, on each side of the neck, they have an apparatus called branchiæ, or gills, which consist of laminæ suspended on arches that are attached to the hyoid bone, each composed of numerous separate laminæ and covered with a tissue of innumerable blood-vessels. The water which the fish swallows escapes between these laminæ through the branchial openings, and by means of the air it contains acts upon the blood that is continually arriving in the branchiæ from the heart, which only represents the right auricle and ventricle of warm-blooded animals. This blood, having received the benefit of respiration, is poured into an arterial trunk situated under the spine, which, exercising the functions of a left ventricle, distributes it to every part of the body, whence it returns to the heart by the veins.

The entire structure of the Fish is as evidently adapted for swimming, as that of the Bird for flight. Suspended in a liquid of nearly the same specific gravity as its own body, there was no necessity for large wings to support it. In a great number of species, immediately under the spine there is a bladder filled with air, which, by compression or dilatation, varies the specific gravity of the fish and assists it to rise or descend. Progression is effected by the motions of the tail, which, by striking the water alternately right and left, forces them forward; the branchiæ, by impelling the water backwards, may also contribute to this effect. The limbs being thus of but little use, are greatly reduced; the parts analogous to the bones of the arms and legs are extremely short, or even completely concealed; *rays*, more or less numerous, which support membranous fins, form a rude representation of the fingers and toes. The fins which correspond to the anterior extremities are termed *pectorals*, and those which answer to the posterior ones, *ventrals*. Other rays attached to particular bones placed on or between the extremities of the spinous apophyses support vertical fins on the back, under the tail, and at its extremity, which, by being raised or lowered, increase or diminish the surface which strikes against the water. The superior fins are called *dorsal*, the inferior *anal*, and that at the end of the tail *caudal*. The rays are of two kinds; some of them consist of a single bony piece, usually hard and pointed, sometimes flexible and elastic, divided longitudinally—these are called *spinous*

rays; others are composed of a great number of small articulations, and generally divided into branches at their extremity—they are the *soft, articulated*, or *branched rays*.

There is as much variety among Fishes, with respect to the number of limbs, as among Reptiles. Most generally there are four; some have but two, and in others they are totally wanting. The bone which is analogous to the scapula, is sometimes held among the muscles as in the higher animals, and at others is attached to the spine, but most commonly it is suspended on the cranium. The pelvis rarely adheres to the spine, and very frequently, instead of being behind the abdomen, is before it, and connected with the humeral apparatus.

Besides the usual parts of the brain which are arranged as in Reptiles one after the other, Fishes have knots or ganglions at the base of their olfactory nerves.

Their nostrils are simple cavities at the end of the muzzle almost always perforated by two holes, and regularly lined by a plated pituitary membrane.

The cornea of their eye is very flat, and there is but little aqueous humour, but the crystalline is very hard and almost globular.

The sense of taste in Fishes can have but little energy, as a great portion of the tongue is osseous, and frequently furnished with teeth and other hard parts.

The body in most of them is covered with scales, and none possess organs of prehension; the fleshy cirri of some may supply the imperfection of the other organs of touch.

Teeth are found in their intermaxillary, maxillary, lower jaw, vomer, bones of the palate, on the tongue, on the arches of the branchiæ, and even on bones behind these arches, attached like them to the hyoides, called pharyngeal bones.

The varieties of these combinations, as well as those of the form of the teeth placed at each point, are innumerable.

Besides the apparatus of the branchial arches, the hyoid bone is furnished on each side with rays which support the branchial membrane. A sort of lid, composed of three bony pieces, the operculum, the subperculum, and the interoperculum, unites with this membrane in closing the great opening of the gills; it is articulated with the tympanal bone, and plays on one called the preoperculum. In many of the Chondropterygii this apparatus is wanting.

Fishes form two distinct series, that of Fishes *properly so styled*, and that of the Chondropterygii, otherwise called Cartilaginous Fishes.

ORDER I.

ACANTHOPTERYGII*.

The *Acanthopterygii* form the first and by far the most numerous division of ordinary fishes. They are recognised by the spines which occupy the place of the first rays of their dorsal, or which alone support the first fin of the back, where there are two; sometimes, instead of a first dorsal, there are only a few free spines. The first rays of their anal are also spines, and there is generally one to each ventral.

FAMILY I.

PERCOIDES.

This family is so called because its type is the common Perch. It comprehends fishes with oblong bodies, covered with scales that are generally hard or rough, and whose operculum or preoperculum, and frequently both, have dentated or spinous edges, and whose jaws, the fore part of the vomer, and generally the palatine bones, are furnished with teeth.

The species are extremely numerous, particularly in the seas of hot climates; their flesh is generally wholesome and agreeable.

In the first subdivision we find seven rays in the branchiæ, two fins on the back, and all the teeth small and crowded.

Perca, *Cuvier.*

The *true Perches* have the preoperculum dentated; the bony operculum terminated by two or three sharp points and a smooth tongue. Sometimes the sub-orbital and the humeral are slightly dentated. North America produces several species.

Labrax, *Cuvier,*

Distinguished from the perches by scaly opercula terminating in two spines, and by a rough tongue.

The United States produce a large and beautiful species, *Labr. lineatus*, Cuv. (The Rock-fish), with longitudinal blackish stripes.

The remaining genera of this division are *Lates, Centropomus, Grammistes, Aspro*, &c. &c. differing in various particulars relative to the operculum and preoperculum, armature of the jaws, &c.

A second subdivision comprises Percoides with two dorsal fins, and long and pointed teeth mingled with the small and crowded ones.

There are two genera, *Ambassis, Lucio-Perca* or Perch-Pike.

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* Spiny-fins.

A second division comprises Percoides with seven branchial rays and one dorsal. They are subdivided in nearly the same way as the preceding ones, as by their teeth, which are either hooked or all small and crowded; notches and spines on the opercula, &c.

In the subdivision, furnished with hooked teeth, we find

Serranus, *Cuvier.*

Preoperculum dentate; the bony operculum terminating in one or several points. This genus contains a vast number of species, and is divided into several subgenera.

We now pass to Percoides with seven branchial rays, and a single dorsal, the teeth small and crowded.

They are distributed under the genera *Acerina*, *Rypticus*, *Centropristis* (to which belongs our Black Perch), and *Gristes*.

The genus Perca, as defined by Artedi and Linnæus, terminates here; but there remains a number of fishes which approach it, although peculiar characters compel naturalists to arrange them in separate genera, such as *Cirrhites*, *Chironemus*, *Pomotis* (our Pond-Perch), *Centrarchus*, &c. &c.

Pomotis, *Cuvier.*

Fishes, with a compressed and oval body, characterised by a membranous prolongation at the angle of the operculum. They inhabit the rivers, &c. of America, where they are called Pond-Perch.

We now pass to those Percoides which have more than seven rays to the branchiæ. Three genera are known, all of which present the following peculiarity: their ventrals have a spine and seven or more soft rays, while in other Acanthopterygii there are never more than five soft rays.

Holocentrum, *Artedi.*

The scales of these beautiful fishes are brilliant and dentated; operculum dentated and spinous; preoperculum dentated with a stout spine at the angle, which is directed backwards. They are found in the hot parts of both oceans.

Myripristis, *Cuvier.*

The brilliancy, shape, and scales of the Holocentra; but the preoperculum has a dentated double border, and there is no spine at the angle. They inhabit the hot parts of both oceans.

Beryx, *Cuvier,*

Differs from Myripristis in having but a single short dorsal, with but a few small spines, almost hidden in its anterior edge; ten soft rays in the ventrals.

All the Percoides of which we have hitherto spoken have their ventrals inserted under the pectorals; there are some genera, however, in which they are differently located.

In the JUGULARES, they are placed on the throat further forwards than the pectorals.

TRACHINUS, *Linnæus.*

A compressed head, approximated eyes, and an oblique mouth; the first dorsal very short, the second very long; pectorals large, and a stout spine on the operculum. They generally remain concealed in the sand; wounds inflicted by the spines of their first dorsal are much dreaded, but their flesh is esteemed. Several species are found in the Atlantic, &c.

Trach. draco, Lin. (The Dragon-Weaver.) Grey and reddish, with blackish spots; blue streaks and yellow tints; thirty rays to the second dorsal; flanks obliquely striated.

One of the most remarkable genera of the Jugulares is that of

URANOSCOPUS, *Linnæus.*

So called because the eyes are placed on the superior surface of the nearly cubical head, and look upwards: the mouth is cleft vertically; the lower part of the preoperculum is crenate, and there is a stout spine to each shoulder; but six rays in the branchiæ. In the mouth and before the tongue is a long and narrow slip, which can be protruded at the will of the fish, and serves, it is said, to attract small ones, while it remains concealed in the mud. They are commonly termed Star-gazers.

In a third division of the Percoides, the ventrals are inserted further back than the pectorals: they are the ABDOMINALES. The first genus is

POLYNEMUS, *Linnæus.*

So named because several of the inferior pectoral rays are free, and form so many filaments; the ventrals are not very far back, and the pelvis is still suspended to the bones of the shoulder. They are allied to the Percoides by the teeth, either small and crowded, or bent back like those of a wool-card, which arm their jaws, vomer, and palate; but their snout is convex, and the vertical fins scaly as in many of the Scienoides: the two dorsals are separated, the preoperculum is dentated, and the mouth deeply cleft: they are found in all the seas of hot climates.

Pol. paradiseus, Lin. (The Mango Fish.) So called from its fine yellow colour; has seven filaments on each side, the first of which are twice the length of the body. It is the most delicious fish found in Bengal.

In the succeeding genera the ventrals are altogether behind, and the pelvis no longer adheres to the bones of the shoulder.

The genera are *Sphyræna, Paralepis,* and *Mullus,* or the Surmullet of Europe.

FAMILY II.

BUCCÆ LORICATÆ.

The family of the *Mailed-Cheeks* contains a numerous suite of fishes, to which the singular appearance of the head, variously mailed and protected, gives a peculiar aspect that has always caused them to be arranged in special genera, although they have many close affinities with the perches. Their common character consists in the sub-orbital being more or less extended over the cheek and articulated behind with the preoperculum. The Uranoscopus is the only one of the preceding family which has any thing like it, but the sub-orbital of the latter, although very broad, is connected behind with the temporal bones, and not with the preoperculum.

Linnæus divided them into three genera, TRIGLA, COTTUS, and SCORPÆNA; it has been found necessary, however, to subdivide them, and to add some of his GASTEROSTEI.

TRIGLA, *Linnæus.*

The above character strongly marked; an enormous sub-orbital completely covering the cheek, and even articulated by an immoveable suture with the preoperculum, so as to allow of no separate motion; sides of the head nearly vertical, giving it a form approaching that of a cube, or parallelopiped; the bones hard and rough. There are two distinct dorsals, and three free rays under the pectoral. Several species, when caught, utter sounds which have procured for them in France their vulgar name of *Grondins*; in England they are called *Gurnards*.

The best of these divisions is the

DACTYLOPTERUS, *Lacepede,*

So celebrated under the name of *Flying Fishes;* the subpectoral rays are much more numerous and longer; and instead of being free, as in the preceding ones, they are united by a membrane so as to form a supernumerary fin, longer than the fish, which supports it in the air for some time. Thus they are seen flying above the surface of the water, in order to escape from dolphins and other voracious fishes; they fall into it again, however, in a few seconds.

D. volitans, the Mediterranean species, is a foot long; brown above, reddish beneath; fins black, variously marked with blue.

D. orientalis, Cuv., is a neighbouring species from the Indian Ocean.

COTTUS, *Linnæus.*

Head broad, depressed, mailed, and variously armed with spines or tubercles; two dorsals; teeth front of the vomer, but none on the palatines; six rays in the branchiæ, and only three or four in the ventrals. The inferior pectoral rays, as in Trachinus, are not branched.

Those that inhabit fresh water have a nearly smooth head, and but one spine to the preoperculum; their first dorsal is very low. The most common species is

C. gobio, Lin. (The River Bull-head.) A small blackish fish, four or five inches in length.

The salt water species are more spinous, and when irritated their head becomes still more inflated. Such is

C. scorpius, Lin. (The Father-Lasher.) Three spines on the preoperculum.

Other groups have lately been observed, which are partly allied to Cottus and partly to Scorpæna. One of them is the

Hemitripterus, *Cuvier.*

The head depressed, and two dorsals as in Cottus; no regular scales on the skin, but teeth in the palate. The head is bristly and spinous, and has several cutaneous appendages. The first dorsal is deeply emarginate, a circumstance which has led some authors to believe they had three.

But one species is known, which is from North America, *Cottus tripterygius*, which is taken along with the cod. From one to two feet long, tinged with yellow and red, varied with brown.

Scorpæna, *Linnæus.*

The head, like that of a cottus, mailed and roughened, but compressed on the sides; body covered with scales; several rays in the branchiæ, and but a single dorsal. If we except the armature of the cheek, and the tubercles, which frequently give them an odd appearance, they closely approximate to certain Percoides, such as the Acerinæ and the Centropristes; but though the inferior rays of their pectorals, as in Cottus, are articulated, they are simple and not branched.

The remaining genera allied to or separated from Scorpæna are *Pterois*, *Blepsias*, *Apistus*, *Agriopus*, *Pelor*, *Gasterosteus* (Stickle-backs of Europe), and the

Monocentris, *Schneider.*

A singular genus; the body is short, thick, and completely mailed with enormous angular, rough, and carinated scales; four or five stout free spines upply the place of the first dorsal; each ventral consists of an immense spine, in the angle of which a few soft and almost imperceptible rays are concealed; head bulky and mailed; front gibbous; mouth large; shor crowded teeth in the jaws and palatines, but none in the vomer; eight rays in the branchiæ. But one species is known, the

Mon. japonica, Bl. Schn. Six inches long, of a silvery white. From the sea of Japan.

After this family we place the

Oreosoma, *Cuvier.*

A small oval fish, whose whole body, above and beneath, is studded with thick cones of a heavy substance. There are four of them on the back, and ten on the belly, arranged in two series, with smaller intermediate ones. It was discovered in the Atlantic, by Péron.

FAMILY III.

SCIENOIDES.

This family is closely related to the Percoides, and even presents nearly similar combinations of external characters, particularly in the indentations of the preoperculum, and in the spines of the operculum; but both vomer and palatines are without teeth; the bones of the cranium and face are generally cavernous, and form a muzzle more or less gibbous. The vertical fins are frequently somewhat scaly.

Some of the Scienoides have two dorsals, and others have but one; among the former we first find the genus

Sciæna,

Whose common characters consist of a gibbous head, supported by cavernous bones, two dorsals, or one deeply emarginate, whose soft part is much longer than the spinous; a short anal, a dentated preoperculum, an operculum terminating in points, and seven branchial rays. If it were not for the absence of the palatine teeth, these fishes would resemble the Perches.

Naturalists divide it into various subgenera. Some of the species, such as the King-fisher (an *Umbrina*), inhabit the American seas.

The Scienoides, with a single dorsal, are subdivided according to the number of their branchial rays.

These divisions are *Hæmulon*, *Pristoma*, and *Diagramma*.

The Scienoides with a single dorsal, and less than seven branchial rays, are still more subdivided: in some of them the lateral line extends to the caudal; in others it is interrupted.

Those Scienoides which have less than seven branchial rays, and an interrupted lateral line, form several genera of small oval fishes, prettily coloured, which may be distinguished by the armature of their head. They are manifestly related to the genus Chætodon, and resemble, externally, several of our fishes with labyrinthian branchiæ.

The genera are *Amphiprion*, *Premnas*, *Promacentrus*, &c.

FAMILY IV.

SPAROIDES.

The *Sparoides*, like the Scienoides, have a palate destitute of teeth. Their general figure and several details of their organisation are the same; they are also covered with scales more or less large, but they have none on the fins. Their muzzle is not gibbous, nor are the bones of their head cavernous; there are neither indentations in their preoperculum, nor spines on their operculum. They never have more than six rays in the branchiæ. They are divided according to the form of their teeth.

In the first tribe, that of SPARUS, Cuv., the sides of the jaw are furnished with round molars like paving stones; we subdivide it into

Sargus, *Pagrus*, *Chrysophris*, and *Pagelus*, differing in certain dental peculiarities. The *Shepherd* of the Philadelphia market belongs to the first named genus.

In the second tribe there is but one genus,

DENTEX, *Cuvier*,

Characterised by conical teeth even on the sides of the jaws, generally in one range, some of the anterior of which are drawn out into large hooks. They would be rather closely allied to the genus Hæmulon, were it not that the indentation of the preoperculum is wanting, and that they have one ray less in their branchiæ. The cheek is scaly. Two species are found in the Mediterranean.

A third tribe is also composed of a single genus,

CANTHARUS, *Cuvier*.

Teeth short and crowded, or bent and crowded all round the jaws; those of the external row being the strongest; body elevated and thick; muzzle short; jaws not protractile. Two species are found in the Atlantic and Mediterranean.

In a fourth tribe, the teeth are trenchant. It comprises two genera, *Boops* and *Oblada*.

FAMILY V.

MENIDES.

THE *Menides* differ from the preceding families in the extreme extensibility and retractility of their upper jaw, which is owing to the length of the intermaxillary pedicles which withdraw between the orbits. Their body is scaly, as in Sparus, in which genus they have hitherto been placed.

There are four genera:—viz. *Mæno*, *Smaris*, *Cæsio*, and *Gerres*, distinguished from each other by the absence of teeth, dorsal higher in front, and by having the mouth protractile.

FAMILY VI.

SQUAMIPENNES,

So called, because the soft, and frequently the spinous parts of their dorsal and anal fins are covered with scales, which encrust them, as it were, and render it difficult to distinguish them from the mass of the body. This is the most remarkable character of these fishes, the body of which is generally much compressed, and the intestines long. They were comprised by Linnæus in the genus

Chætodon.

So named from their teeth, which in length and tenuity resemble hairs, collected in several close rows like a brush. Their mouth is small; their dorsal and anal fins are so completely covered with scales, similar to those on the back, that it is extremely difficult to ascertain where they commence. These fishes are very abundant in the seas of hot climates, and are adorned with the most beautiful colours, circumstances which have caused many to be figured, and rendered them common in our cabinets. They frequent rocky shores, and are eaten.

This genus is now divided into various subgenera, the most remarkable of which is

Chelmon, *Cuvier*,

Separated from Chætodon on account of the extraordinary form of the snout, which is long and slender, only open at the extremity, and formed by a most excessive prolongation of the intermaxillary and lower jaw. Their teeth are very fine and crowded, rather than like hairs.

One species, *Chæt. rostratus*, Lin., has the faculty of spurting drops of water on the insects it perceives on the shore, and thus bringing them within reach.

The following genera, which we place next to Chætodon, on account of their scaly fins, differ greatly from it, however, in the teeth with which their palatines and vomer are furnished. The genus

Brama, *Bl. Schneider*.

Is connected with this family by the scales covering the vertical fins, which have but a small number of spinous rays concealed in their anterior edges; but they have slender bent teeth in the jaws and palatines, an elevated profile, very short snout, a forehead descending vertically, and a mouth, when shut, that is almost vertical; the scales extend on to the maxillaries; there are seven rays in the branchiæ; a dorsal and low anal, but commencing in a salient point.

But one species is known, *Sparus Raii*, Bl.; it inhabits the Mediterranean,

and sometimes strays into the ocean; an excellent fish, of a burnished steel colour, which attains a large size, but is infested with various species of intestinal worms.

Pempheris, *Cuvier*,

A long and scaly anal, the dorsal short and elevated; head obtuse; the eye large; a small spine on the operculum; small crowded teeth on the jaws, vomer, and palatines. From the Indian Ocean.

Toxotes, *Cuvier.*

The body short and compressed, the dorsal placed on the last half of the body, with very stout spines; the soft part, as well as that of the anal which corresponds to it, scaly; the snout depressed, short; lower jaw projecting beyond the upper one; the small crowded teeth very short in both jaws, the extremity of the vomer, palatines, pterygoids, and on the tongue; six rays in the branchiæ; inferior edge of the infra-orbital and preoperculum, finely serrate.

The species known, *Toxotes jaculator*, Cuv., is celebrated for the same faculty that distinguishes the *Chæt. rostratus*. By spurting drops of water on insects which frequent aquatic plants, they are beaten down and brought within its reach. It can force the water to a height of three or four feet, and rarely misses its aim.

FAMILY VI.

SCOMBEROIDES.

Our seventh family is composed of a multitude of fishes with small scales, a smooth body, and whose tail and caudal fin in particular are extremely powerful.

This family is of the greatest utility to man, by the size and flavour of its species, and their inexhaustible reproduction, which brings them periodically into the same latitudes, where they constitute the object of the most extensive fisheries.

Scomber, *Linnæus.*

The first dorsal entire; while on the contrary, the last rays of the second, as well as those of the anal which correspond to them, are detached, forming what are termed false or spurious fins, or *pinnæ spuriæ*. The genus is subdivided as follows:—

Scomber, *Cuvier.*

The *Mackarels* have a fusiform body covered with uniformly small and smooth scales; two little cutaneous crests on the sides of the tail; an empty space between the first and second dorsal.

Sc. scombrus, Lin. (The Common Mackarel.) Blue back, varied with black undulating streaks; five false fins above and beneath.

THYNNUS, *Cuvier.*

A soft corslet round the thorax, formed by scales larger and smoother than those on the rest of the body; a cartilaginous carina between the two little crests on the sides of the tail; the first dorsal extends close to the second.

Sc. thynnus, Lin. (The Tunny.) This fish has been taken in the Mediterranean, from a very ancient date, and by its abundance constitutes a great source of wealth to Provence, Sardinia, Sicily, &c. It is said to attain the length of fifteen and eighteen feet, and has nine spurious fins above, and as many beneath; the pectorals are one-fifth of its whole length. There are some other subgenera.

XIPHIAS, *Linnæus.*

These fishes belong to the family of the Scomberoïdes, and approach the tunnies, particularly in their excessively small scales, in the carinæ on the sides of their tail, in the power of their caudal fin, and in their whole internal organisation. Their distinguishing character consists in the beak, (whence their name of *sword-fish*,) or ensiform point or tusk, which terminates their upper jaw; a powerful weapon, with which they attack the largest sea animals. This beak is chiefly composed of the vomer and intermaxillaries, being strengthened at its base by the æthmoid, frontals, and maxillaries. Their branchiæ are not pectinated; each of them being formed of two large parallel laminæ, the surface of which is reticulated. They swim with astonishing swiftness, and their flesh is excellent.

Xiphias gladius, Lin. (The Sword-Fish.) The point horizontally flattened and trenchant like the broad blade of a sword; sides of the tail strongly carinated. It has but one dorsal, which rises from before and from behind; the middle of it becoming worn with age gives it the appearance of being double. It is one of the largest and best fishes of the European seas, frequently attaining the length of fifteen feet. It is more common in the Mediterranean than in the Atlantic Ocean. A parasitic crustaceous animal penetrates into its flesh, and sometimes renders it so furious that it dashes itself on shore.

CENTRONOTUS, *Lacepede.*

A genus of Scomberoides, characterised by the spines, which, in the Acanthopterygii in general, form the anterior portion of the dorsal, or a first separate dorsal, but in them are free and unconnected by a common membrane; they all have ventrals. They are subdivided into four subgenera. In

NAUCRATES, *Rafinesque,*

The dorsal spines are free; body fusiform; a carina in the sides of the tail as in the tunny, and two free spines before the anal fin.

The common species is blue with broad vertical bands of a much deeper blue. The vulgar name of *Pilot-fish* owes its origin to the fact, that it follows vessels to seize upon what may fall from them; and as a similar habit is

observed in the shark, it has been said that the former acts as a guide or pilot to the latter; it is not above a foot long.

There are various other genera belonging to this family, such as *Rhynchobdella, Notacanthus, Seriola, Nomeus, Caranx, Vomer, Zeus* (The Common Dory), &c. &c.

FAMILY VIII.

TÆNIOIDES*.

This family is closely connected with the Scomberoides, and its first genus is even intimately allied with Gempilus and Thyrsites; the fishes which compose it are elongated, flattened on the sides, and have very small scales.

In the first tribe we find the muzzle elongated, the mouth cleft and armed with strong pointed and trenchant teeth, and the lower jaw advancing beyond the upper one: it comprises but two genera,

LEPIDOPUS, *Gouan,*

Whose special character consists in the reduction of the ventrals to small scaly plates. The thin and elongated body is furnished with a dorsal above, which extends throughout its length, with a low anal beneath, and terminates in a well formed caudal; there are eight rays in the branchiæ.

TRICHIURUS, *Linnæus.*

The same form of body, muzzle, and jaws, as in Lepidopus; similar pointed and trenchant teeth, and a dorsal extending along the back, but the ventrals and caudal are wanting, and the tail is drawn out into a long, slender, and compressed filament. In lieu of the anal there is merely a suite of small and hardly perceptible spines on the under edge of the tail; the branchiæ have but seven rays. They resemble beautiful silver ribands.

A second tribe comprehends genera in which the mouth is small, and but slightly cleft.

GYMNETRUS, *Bl. Schneider.*

The body elongated and flat, as in all the preceding divisions, and totally deprived of the anal fin; but there is a long dorsal, whose lengthened anterior rays form a sort of panache, but they are easily broken; the ventrals, when not worn or broken, are very long, and the caudal, composed of very few rays, rises vertically from the extremity of the tail, which ends in a small hook.

The Arctic Ocean produces two species, called in Norway the *King of the Herrings;* one of which is said by some to have one hundred and twenty rays, and by others one hundred and sixty, and to attain the length of ten feet; the other has more than four hundred rays, and is eighteen feet in

* Riband-like.

length. The ventrals consist of a long filament dilated near the extremity. They are also found in India.

STYLEPHORUS, *Shaw.*

A vertical caudal, as in Gymnetrus, but shorter; the extremity of the tail, instead of being curved into a small hook, is prolonged into a slender cord longer than the body. But one specimen is known.

In a third tribe the snout is short, and the mouth cleft obliquely.

CEPOLA, *Linnæus.*

A long dorsal and anal, both reaching to the base of the caudal, which is tolerably large; no rise in the cranium; snout short; lower jaw curved upwards; the teeth prominent, and the ventrals sufficiently developed.

LOPHOTES, *Giorna.*

A short head, surmounted with a high osseous crest; to whose summit a long and stout spine is articulated, bordered behind with a membrane and a low fin, whose rays are nearly all simple, extending from this spine to the point of the tail, which has a distinct, but very small caudal.

FAMILY IX.

THEUTYES.

OUR ninth family is as closely allied to the Scomberoides as the preceding one, but in other points, such as the armature, which is found in several genera on the sides of the tail, or in others, the horizontal spine before the dorsal, &c. It contains but very few genera; they all have a compressed, oblong body; a small mouth, but slightly or not at all protractile, each jaw of which is armed with a single range of trenchant teeth; palate and tongue without teeth, and a single dorsal. They are herbivorous, feeding on fucus and other marine plants.

SIGANUS, *Forsk.*

These fishes have a remarkable character—unique, in icthyology—in their ventrals, which are furnished with two spinous rays, one external, the other internal; the three intermediate ones branching as usual. They have five branchial rays, and a horizontal spine before the dorsal. The styloid bones of their shoulder curve as they lengthen, so as to unite at their extremities with the first interspinal of the anal. Numerous species are found in the Indian Ocean.

The remaining genera are *Acanthurus* (Sturgeons), *Prionurus*, *Naseus*, *Axinurus*, and *Priodon*.

FAMILY X.

This family is distinguished by

LABYRINTHIFORM PHARYNGEALS.

By this we mean, that part of the superior pharyngeals of these fishes are divided into small irregular lamellæ, more or less numerous, intercepting cells containing water, which thus flows upon and humects the branchiæ, while the animal is removed from its proper element. By this it is enabled to quit the rivulet or pool, which constitutes its usual abode, and crawl to a considerable distance from it; a singular faculty, not unknown to the ancients, and which induces the people of India to believe that they fall from heaven. The two most remarkable genera of this family are the following.

Anabas, *Cuvier.*

It is in this genus that we find the greatest degree of complication in these labyrinths; the third pharyngeals, however, have teeth arranged like paving stones, and there are others behind the cranium. Their body is round and covered with strong scales, their head broad, muzzle short and obtuse, and mouth small; the lateral line is interrupted at its posterior third.

An. testudineus, Cuv., called the *Paneiri* or *Tree-Climber;* highly celebrated, because it not only leaves the water, but, according to Daldorf, even climbs up the shrubs on its banks; this latter assertion, however, is denied. Found throughout all India, and the only species known, the

Ophicephalus, *Blumenbach,*

Resembles the preceding genus in most of its characters, and particularly in the cellular conformation of the pharyngeals, which are adapted to retain water. These fishes also creep to a considerable distance from their liquid abodes; but what particularly distinguishes, and even separates them from all other Acanthropterygii, is the absence of spines in the fins, the first ray of their ventrals at most excepted, and even that, though simple, is not sharp and stiff. The jugglers of India exhibit this fish out of water, and even the children amuse themselves by forcing it to crawl upon the ground. In the markets of China the larger species are cut up alive for distribution. They may be divided by the number of their dorsal rays.

FAMILY XI.

MUGILOIDES.

Our eleventh family of the Acanthopterygii is composed of the genus—

MUGIL, *Linnæus.*

These fishes present so many peculiarities in their organisation, that they may be considered as forming a distinct family; their body is almost cylindrical, covered with large scales, and furnished with two separate dorsals, the first of which has but four spinous rays; the ventrals are inserted a little behind the pectorals. There are six rays in the branchiæ; their head is somewhat depressed, and covered with large scales or polygonal plates, their muzzle very short. Their transverse mouth, in consequence of a prominence in the middle of the lower jaw, which corresponds with a depression in the upper one, forms an angle, the teeth being excessively tenuous, and frequently almost imperceptible.

They resort to the mouths of rivers in large troops, and are continually leaping out of the water; the European seas produce several species hitherto very imperfectly ascertained; their flesh is esteemed.

M. cephalus, Cuv. (The Common Mullet.) Distinguished from all the other species of Europe by its eyes, which are half covered by two adipose veils, adhering to the anterior and posterior edge of the orbit.

There are two other genera, *Tetragonurus* and *Atherina* (the Aphyes of the ancients).

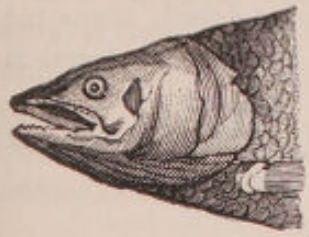
FAMILY XII.

GOBIOIDES.

THE *Gobioides* are known by the length and tenuity of the dorsal spines.

BLENNIUS, *Linnæus.*

Blennies have a strongly marked character in the ventral fins, which are placed before the pectorals, and consist of only two rays. The body is elongated and compressed, and has but a single dorsal almost entirely composed of simple but flexible rays. They live in small troops among the rocks on the coast, leaping and playing, and are capable of living without water for some time. A slimy mucus is smeared over their skin, to which they owe their Greek name of *Blennius*. They are now distributed in various subgenera, such as *Myxodes*, *Salarius*, *Clinus*, &c.



ANARRHICHAS, *Linnæus*.*

So very similar are these fishes to the Blenny, that I would willingly name them *Blennies without ventrals.*

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* *Anarrhichas*, Climber, a name invented by Gesner, because this fish is said to climb upon rocks and shoals by the aid of its fins and tail.

A. lupus, Lin., (The Sea Wolf,) is the most common species; it inhabits northern seas, and is frequently seen on the coast of Europe; six or seven feet long; brown, with clouded bands of deep brown; the flesh resembling that of an eel. This fish is valuable to the Icelanders, who salt and dry the flesh for food, employ the skin as shagreen, and the gall as soap. The

Gobius, *Linnæus*,

Commonly called *Gobies*, or *Sea Gudgeons*, are instantly recognised by the union of their thoracic ventrals, either along the whole of their length, or at least at their base, forming a single hollow disk more or less infundibuliform. The spines of the dorsal are flexible, the branchial apertures provided with five rays only, and generally but slightly open. They are small or moderate sized fishes, which live among the rocks near the shore. They prefer a clayey bottom, where they excavate canals in which they pass the winter. In the spring they prepare a nest in some spot abounding with fucus, which they afterwards cover with roots of the Zostera; here the male remains shut up, and awaits the females, who successively arrive to deposit their eggs; he exhibits much care and courage in defending and preserving them. This genus also is variously subdivided.

Callionymus, *Linnæus*.

Fishes of this genus have two strongly marked characters; one in their branchiæ, which have but a single aperture, consisting of a hole on each side of the nape; and another in their ventrals, which are placed under the throat, are separate, and larger than the pectorals. Their head is oblong and depressed, their eyes approximated and directed upwards, their intermaxillaries protractyle, and their preopercula elongated behind and terminating in some spines. Their teeth are small and crowded, but there are none in the palate. They are pretty fishes with a smooth skin, whose anterior dorsal, supported by a few cetaceous rays, is sometimes very elevated. The second dorsal is elongated as well as the anal.

It is with some hesitation that I close this family with a genus which will one day probably form the type of a separate family; I mean the

Chirus, *Stell.*

Fishes with a tolerably long body, furnished with ciliated scales; a small unarmed head; slightly cleft mouth, provided with small, unequal, conical teeth; the spines of whose dorsal are almost always very delicate, the fin itself extending the whole length of the back. Their distinguishing character consists in several series of pores, similar to the lateral line, or, as it were, in several lateral lines. They frequently have an appendage on the eye-brow, as is the case with certain Blennies, but their ventrals consist of five soft rays, as usual. The species known are from the sea of Kamschatka.

FAMILY XIII.

PECTORALES PEDICULATI.

This family consists of certain Acanthopterygii, whose carpal bones are elongated, so as to *form a sort of arm, which supports their pectorals.* It comprises two genera, which are closely approximated, although authors have generally placed them at a distance from each other, and which are closely allied to the Gobioides.

Lophius, *Linnæus*[*].

The general character of this genus, independently of the semi-cartilaginous skeleton and the naked skin, consists in the pectorals being supported by two arms, as it were, each of which is formed of two bones that have been compared to the radius and ulna, but which in reality belong to the carpus, and which in this genus are longer than in any other; in the ventrals being placed very far before these pectorals; in opercula and branchiostegous rays enveloped in the skin, and, finally, in the only opening of the gills being a hole situated behind the said pectorals. They are voracious fishes, which survive a long time out of water, on account of the smallness of their branchial apertures.

L. piscatorius, Lin.; *Sea Devil*; *Galanga*, &c. (The Angler.) A large fish, of from four to five feet in length, inhabiting the seas of Europe, whose hideous figure has rendered it celebrated.

FAMILY XIV.

LABROIDES.

This family is easily recognised; the body is oblong and scaly; a single dorsal is supported in front by spines, each of which is generally furnished with a membranous appendage; the jaws are covered with fleshy lips; there are three pharyngeals, two upper ones attached to the cranium, and a large lower one, all three armed with teeth, now resembling a pavement and then pointed or laminiform, but generally stronger than usual.

Labrus, *Linnæus*.

A very numerous genus of fishes, which strongly resemble each other in their oblong form; their double fleshy lips, from which they derive their name, one adhering immediately to the jaws, and the other to the suborbitals; their crowded branchiæ with five rays; their conical maxillary teeth, the middle and anterior of which are the longest, and their cylindrical and blunt pharyngeal teeth arranged like a pavement, the upper ones on two large plates, the lower on a single one, which corresponds to the two others.

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[*] *Lophius*, a name made by Artedi, from λοφια (*pinna*), on account of the crests of their head. The ancients called them βατραχος, and *Rana*, or Frog.

Our *Blackfish* or *Tautog* is a true *Labrus*. This genus is divided into nine subgenera, differing in the teeth, mouth, &c. &c. The most remarkable is the

EPIBULUS, *Cuvier*.

Remarkable for the excessive protractility of their mouth, which by a see-saw motion of their maxillaries, and the sliding forwards of their intermaxillaries, instantly becomes a kind of tube. They employ this artifice to capture the small fry which pass within reach of this singular instrument.

But a single species is known, *Sparus insidiator*, Pal., of a reddish colour. From the Indian Ocean.

CHROMIS, *Cuvier*.

The lips, protractile intermaxillaries, pharyngeals, dorsal filaments, and port of a labrus; but the teeth of the pharynx and jaws resemble those of a card, and there is a range of conical ones in front. The vertical fins are filamentous, those of the belly being even frequently extended into long threads; the lateral line is interrupted.

C. vulgaris, The common or *black Coracinus* of the ancients. A small chestnut-brown fish, taken by thousands in the Mediterranean.

SCARUS, *Linnæus*.

A genus of fishes with remarkable jaws (that is, their intermaxillary and premandibular bones), which are convex, rounded, and furnished with teeth, arranged like scales upon their edge, and upon their anterior surface; these teeth succeed each other from behind forwards, so that those of the base are the newest, and in time form a row on the edge. They have the oblong form of a labrus, large scales, and an interrupted lateral line; they have three pharyngeal plates, two above and one below, furnished with teeth as in a labrus; but these teeth are transverse blades, and not like rounded paving stones.

A species blue or red, according to the season, is found in the Archipelago, which is the *Scarus creticus*, Aldrov., and which late researches have convinced me is the *Scarus*, so highly celebrated among the ancients; the same that Elipertius Optatus, commander of a Roman fleet, during the reign of Claudius, went to Greece in search of, for the purpose of distributing it through the sea of Italy. It is an article of food in Greece at the present day.

Numerous species are found in the seas of hot climates. The form of their jaws and the splendour of their colours have caused them to receive the vulgar appellation of *Parrot-fishes*.

FAMILY XV.

FISTULARIDÆ.

THE fishes of this family are characterised by a long tube, in the fore-part of the cranium, formed by the prolongation of the æthmoid, vomer, preoper-

cula, interopercula, pterygoidals and tympanals, and at the extremity of which is the mouth, composed as usual of the intermaxillaries, maxillaries, and the palatine and mandibulary bones.

Some of them, as the Fistulariæ, have a cylindrical body, in others, as in the Centrisci, it is oval and compressed.

Fistularia, *Linnæus.*

The name of these fishes, in particular, is derived from the tube common to the whole family. The jaws are, at their extremity, slightly cleft in a nearly horizontal direction. The head, thus elongated, constitutes a third or fourth of the total length of the body, which is itself long and thin. There are six or seven rays in the branchiæ, and some bony appendages extend behind the head, upon the anterior part of the body, which they strengthen more or less. The dorsal is opposite to the anal fin.

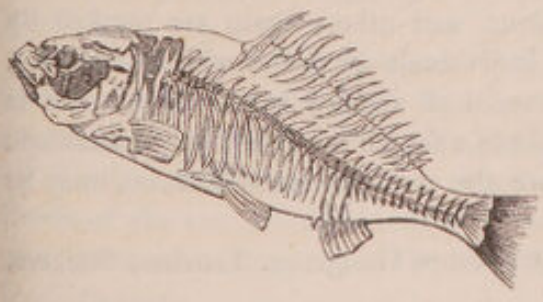
Centriscus, *Linnæus.*

In addition to the tubular snout of the family, the fishes of this genus have an oval or oblong (not elongated) body, compressed on the side, and trenchant beneath; branchiæ composed of but two or three slender rays; a first spinal dorsal and small ventrals behind the pectorals. The mouth is very small, and cleft obliquely.

ORDER II.

MALACOPTERYGII ABDOMINALES*.

The second division of common fishes, or that of the *Malacopterygii*, contains three orders, characterised by the position of the ventrals or by their absence.



In this order the ventrals are suspended to the under part of the abdomen and behind the pectorals, without being attached to the bones of the shoulder. It is the most numerous of the three, and comprehends most of the fresh-water fishes, they are formed to swim in more shallow water than those fishes which have the fins in a more forward position. The abdominal fins also appear to keep the body more steady in troubled waters than those that have them anterior to the pectorals. We subdivide it into five families.

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* *Malacopterygii*, soft-finned.

FAMILY I.

CIPRINIDÆ.

The *Ciprinidæ* or Carp family are recognised by the slightly cleft mouth; the weak jaws, generally edentated, and whose border is formed by the intermaxillaries; by the deeply dentated pharyngeals which compose the trifling armature of the jaws, and by the smaller number of the branchial rays. Their body is scaly, and they have no adipose dorsal, such as we shall find in the Siluri and in the Salmons. Their stomach has no cul-de-sac, neither are there any cæcal appendages to their pylorus. Of all the fishes they are the least carnivorous.

Cyprinus, *Linnæus.*

A very numerous and natural genus, easily distinguished by the small mouth, edentated jaws, and the three flat rays of the branchiæ. The tongue is smooth; the palate provided with a thick, soft, and singularly irritable substance, commonly termed a "carp's tongue." The pharynx presents a powerful instrument of mastication, consisting of stout teeth attached to the inferior pharyngeals, which are so arranged as to be able to squeeze alimentary matters between them, and of a stony disk set in a wide cavity under a process of the sphenoid. These fishes have but one dorsal, and their body is covered with scales, which most commonly are very large: they live in fresh water, and are, perhaps, the least carnivorous of the whole class, feeding chiefly on seeds, grass, and even ooze.

They are variously subdivided. To *Cyprinus proper*, or the true Carps, belongs the well known

Cyp. auratus, Lin. (The Golden Carp or Gold and Silver Fish.) Dorsal and anal spines dentated as in the common Carp. This fish is at first blackish, and by degress assumes that splendid golden red which characterises it; some, however, are of a silver colour, and others again are marked by various shades of the three colours. Individuals are found without a dorsal, others have a very small one; the caudal of a third is very large, and is divided into three or four lobes; the eyes of a fourth are excessively distended; all these accidental changes, which are the result of domestication, may be variously combined.

To the other subdivisions belong the Breams, Gudgeons, Tenches, Suckers, &c.

Cobitis, *Linnæus.*

The head small, body elongated, invested with small scales and covered with mucus; ventrals very far back, and above them a single small dorsal; the mouth at the extremity of the snout, but slightly cleft, without teeth, but encircled by lips fitted for sucking, and with cirri; but three rays in the branchiæ, the apertures of which are small; the inferior pharyngeals strongly dentated.

ANABLEPS, *Blumenbach.*

The fishes of this genus, for a long time, and very improperly, united with the Cobites, possess very peculiar characters: the cornea and iris of their very prominent eyes, which are placed under a roof formed on each side by the frontal, are divided into two portions by transverse bands, so that the organ of sight has two pupils, and appears to be double, although it has but one crystalline and one vitreous humour, and but one retina, a peculiarity of which there is no other example among vertebrated animals.

But a single species is known; the *Anableps tetrophtalmus*, Bl.; it inhabits the rivers of Guiana.

FAMILY II.

ESOCES.

We find no adipose fin in this family. The edge of the upper jaw is



formed by the intermaxillary, or when it is not completely so formed, the maxillary is edentated and concealed in the thickness of the lips. The fishes which compose it are extremely voracious. With the exception of the Microstomæ, all those that are known have the dorsal opposite to the anal. Linnæus united them in the genus

ESOX, *Linnæus.*

The *Pikes, properly so called*, have small intermaxillaries furnished with little pointed teeth in the middle of the upper jaw, of which they form the two-thirds, those on the sides of the jaw being edentated. The vomer, palatines, tongue, pharyngeals and rays of the branchiæ, bristled with teeth resembling those of a carp; a series of long pointed teeth on the sides of the lower jaw.

E. lucius, Lin. (The Common Pike). Well known as one of the most voracious and destructive of fresh water fishes, but whose flesh is highly esteemed. This species, which inhabits Europe, is also found in the fresh waters of North America, where two other species are also to be met with; the flanks of the one, *Esox reticularis*, Lesueur, are marked with brownish lines, sometimes resembling net-work; the other, *Esox estor*, is sprinkled with round blackish spots.

This genus is also subdivided into several subgenera. The most remarkable is the

BELONE, *Cuvier.*

The whole edge of the upper jaw, which as well as the lower one is extended into a long snout, formed by the intermaxillaries,—both furnished with small teeth, no others in the mouth, and those of the pharynx *en pavé*. The body is elongated and covered with scales, which are not very apparent,

one longitudinal carinated range near the lower edge excepted. The bones are very remarkable for their colour, which is a beautiful green.

B. vulgaris (The Gar-Fish). Two feet long; green above, white beneath; found on the coast of France, where its flesh is much esteemed, notwithstanding the colour of the bones. Neighbouring species inhabit all seas. The bite of one of them, which is said to attain a length of eight feet, is considered dangerous.

Exocetus, *Linnæus.*

These well known, or *Flying-fishes,* as they are called, are instantly distinguished among the Abdominales by the excessive size of their pectorals, which are sufficiently large to support them in the air for a few moments. Their head and body are scaly, and a longitudinal range of carinated scales forms a salient line on the lower part of each flank, as in the Hemiramphi, &c. The head is flattened above and on the sides; the dorsal placed above the anal; the eyes large, the intermaxillaries without pedicles and constituting the whole edge of the upper jaw; their two jaws are furnished with small pointed teeth, and their pharyngeals with teeth like a pavement.

They do not fly far: rising in the air to avoid their voracious enemies, they soon fall into the sea, their wings merely acting as parachutes. Birds pursue them through the air and fishes through the water. They are found in all the seas of hot and temperate climates.

E. exilens, Bl. Common in the Mediterranean, and easily recognised by the length of its ventrals, placed posterior to the middle of the body; the fins of the young are marked with black bands.

E. volitans, Bl. Common in the Atlantic Ocean, and has small ventrals placed anterior to the middle of the body.

The American seas produce species with cirri, which are sometimes simple, sometimes double, and even ramous.

Next to the family of the Esoces, we place a genus of fishes, which, though varying but little from the former, has some anatomical difference. It will most probably give rise to a particular family. It is the *Mormyrus,* Linnæus. They are found in the Nile.

FAMILY III.

SILURIDÆ.

This family is distinguished from all others of the order by the want of true scales, having merely a naked skin or large osseous plates. The intermaxillaries, suspended under the ethmoid, form the edge of the upper jaw, and the maxillaries are reduced to simple vestiges, or are extended into cirri. The first ray of the dorsal and pectoral is, almost always, a strong articulated spine and, there is frequently an adipose one behind, as in the salmon.

SILURUS, *Linnæus.*

A numerous genus, easily recognised by its nudity, the mouth cleft in the extremity of the snout, and in the greater number of the subgenera, by the strong spine which forms the first ray of the pectoral. It is so articulated with the bone of the shoulder that the fish can either depress it, or raise it perpendicularly, when it is immoveable, constituting a dangerous weapon, wounds from which are considered as poisoned, an idea arising from the fact that tetanus frequently ensues. They are usually called *Cat-fish.*



S. glanis, Lin. The largest fresh water fish found in Europe, and the only one of this extensive genus that it possesses; it is smooth, black, greenish, spotted with black above, with yellowish white beneath; head large; with six cirri; it sometimes exceeds six feet in length, and weighs three hundred pounds. It inhabits the rivers of Germany and Hungary, the lake of Haarlem, &c., and conceals itself in the mud to watch for prey. The flesh, which is fat, is employed in some places for the same purposes as lard. There are various subgenera.

MALAPTERURUS, *Lacepede,*

Is distinguished from Silurus, properly so called, by the absence of the radiated fin on the back, there being nothing but a small adipose one on the tail, and by the total deficiency of a spine in the pectorals, whose rays are entirely soft. The head as well as the body is covered with a smooth skin; the teeth are small and crowded, and arranged in a broad crescent both above and below; there are seven rays in the branchiæ, and the jaws and viscera resemble those of a Silurus.

M. electricus, the *Raasch* or *Thunder* of the Arabs. The only species known; it has six cirri, and the head is not so big as the body, which is enlarged forwards. This celebrated fish, like the Torpedo and Gymnotus, has the faculty of communicating an electric shock. The seat of this power seems to be in a particular tissue, situated between the skin and the muscles, and presenting the appearance of a fatty cellular tissue abundantly furnished with nerves. From the Nile and the Senegal.

The remaining genera of this family are *Aspedro* and *Loricaria.*

FAMILY IV.

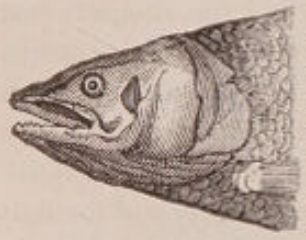
SALMONIDES.

THE *Salmon* family, according to Linnæus, form but a single great genus, clearly characterised by a scaly body, with a first dorsal, whose rays are all soft, followed by a second one small and adipose, that is formed of skin filled with fat, and unsupported by rays. It comprises fishes with numerous cæca and a natatory bladder; nearly all of them ascend rivers, and are highly

esteemed. They are naturally voracious. The structure and armature of the jaws are singularly various.

SALMO, *Linnæus.*

The *Salmon, properly so called*, or rather, *the Trout*, has a great portion of the edge of the upper jaw formed by the maxillaries; a range of pointed teeth in the maxillaries, intermaxillaries, palatines and mandibularies, and a double one on the vomer, tongue, and pharyngeals; so that of all fishes, it is the most completely furnished with teeth. In the old male the end of the lower jaw is bent up towards the palate, where a cavity receives it when the mouth is closed. The ventrals are opposite to the middle of the first dorsal, and the adipose to the anal. There are ten branchial rays or thereabout. The body is usually spotted, and the flesh good. These fishes ascend rivers to spawn, leaping over cataracts, &c., and are even found in the brooks and small lakes of the highest mountains.



S. salar, Lin. (The Salmon.) The largest species of the genus, with red flesh and irregular brown spots, which soon disappear in fresh water; the cartilaginous hook formed by the lower jaw is inconsiderable even in the old male. Found in all the Arctic seas, whence it enters the rivers in the spring. The value of this fishery in all northern countries is well known.

Besides these Salmons and Trouts which are found in Europe, several others have been described by American naturalists, but they have not been sufficiently compared with the former.

In one of the various subdivisions of this great genus (*Osmerus*), we find the *Smelt*.

STERNOPTYX, *Herman.*

A genus of small fishes with a very elevated and compressed body, supported by the ribs; their mouth is directed upwards; their humerals form a trenchant crest in front, terminated below by a small spine, and the bones of the pelvis form another, also terminated by a small spine in front of the ventrals. There is a series of small fossulæ along each side of the pelvic crest, which has been considered as a festooned duplicature of the sternum, whence the name of *Sternoptyx*. They are taken in the warm parts of the Atlantic Ocean.



FAMILY V.

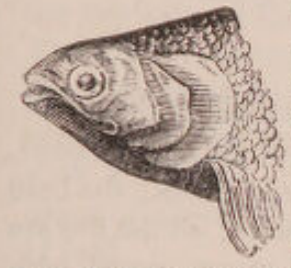
CLUPEÆ,

Or *Herring* family, is easily recognised; there is no adipose fin; the upper jaw is formed, as in the Trouts, by intermaxillaries without pedicles in the middle, and by the maxillaries on the sides; the body is always covered with numerous

scales, and in the greater number we find a natatory bladder and many cæca. A part only of the family ascend rivers.

CLUPEA, *Linnæus.*

The *Herrings* have two well-marked characters in the narrow and short intermaxillaries, that constitute but a small portion of the upper jaw, the sides of which are completed by the maxillaries, so that these sides are alone protractile; and in the inferior edge of the body, which is compressed, and where the scales form notches resembling those of a saw. The maxillaries, besides, are divided into three parts. The branchiæ are so much cleft, that all the fishes of the genus are said to die instantly when taken from the water. The sides of the branchia rays next to the mouth are pectiniform. Of all fishes, these have the finest and most numerous bones.



C. harengus, Lin. (The Common Herring.) This celebrated fish leaves the Arctic seas every summer, and descends in autumn on the western coast of France in numberless legions, or rather in solid shoals of incalculable extent spawning on the way, and arriving at the mouth of the British channel in the middle of winter, in a very attenuated condition. Whole fleets are occupied in this fishery, the extent and importance of which are too well known to need a comment. The best are those taken in the North; such as are caught on the coast of Lower Normandy are lean, dry, and of a disagreeable flavour.

To this division, or *Clupea proper*, belong the Sprat, White-Bait, Pilchard, and Sardine.

ALOSA, *Cuvier.*

Differs from Clupea, properly so styled, in an emargination of the middle of the upper jaw; all the other characters are those of the Pilchard and Sardine.

A. vulgaris (The Shad). A much larger and thicker fish than the Herring, attaining a length of three feet, and distinguished by the absence of sensible teeth, and by an irregular black spot behind the gills. It ascends the rivers in spring, and is then highly esteemed; when taken at sea, it is dry and of a disagreeable flavour.

Next to the true Clupeæ come some genera, which approach them in the trenchant and indented abdomen. They are *Odontognathus*, *Pristigaster*, *Notopterus*, *Engraulis* (the Anchovy), *Megalops*, *Elops*, *Hyodon*, &c. &c.

ORDER III.

MALACOPTERYGII SUBRACHIATI.

THIS order is characterised by *ventrals inserted under the pectorals*; the pelvis is also directly suspended to the bones of the shoulder. It contains almost as many families as genera.

FAMILY I.

GADITES.

The *Cod* family is almost wholly composed of the great genus.

Gadus, *Linnæus.*

Recognised by the ventrals, which are pointed and attached to the throat.



The body is moderately elongated, slightly compressed, and covered with rather small and soft scales; the head is well proportioned, but without scales; all the fins are soft; the jaws and front of the vomer armed with pointed, unequal, moderate or small teeth, disposed in several rows, and resembling a card or rasp; the branchiæ are large, and have seven rays. Most of the genus have two or three fins on the back, and a distinct caudal. The stomach forms a strong and large sac. The natatory bladder is large, strong, and frequently dentated on the sides.

The greater number of these fishes inhabit cold or temperate seas, and constitute the object of important fisheries. Their white flesh, easily separated in layers, is generally esteemed as light, wholesome, and sapid. They are subdivided into several subgenera. In *Morrhua,* we have

Gadus morrhua, Lin. (The Cod.) From two to three feet long; back spotted with yellowish and brown: it inhabits the whole Northern Ocean, and multiplies so excessively in north latitudes, that whole fleets are annually employed in the fishery.

Gadus æglefinus, Lin. (The Haddock.) The back brown, belly silvery, and lateral line black; a blackish spot behind the pectoral; quite as numerous in northern latitudes as the Cod, but not so much esteemed.

In the subgenera of *Gadus* we find the Whiting, Hake, Ling, &c.

FAMILY II.

PLANI.

The second family of the *Malacopterygii Subrachiati,* commonly called *Flatfishes,* comprises the great genus

Pleuronectes, *Linnæus* *.

These fishes present a character, which, with respect to vertebrated animals,

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* *Pleuronectes,* a name formed by Artedi, from πλευρα the flank, and νηκτης a swimmer, because they swim on the side. The ancients gave them different names according to the species, such as *Passer, Rhombus, Buglossa,* &c.

is perfectly unique: it is the total want of symmetry in the head, where both eyes are on one side, which always remains uppermost when the animal is swimming, and which is always deeply coloured, while that on which the eyes are wanting is always whitish. The remainder of the body, although, generally speaking, formed as usual, participates a little in this irregularity. Thus the two sides of the mouth are not equal, and the two pectorals are rarely so. Their body is strongly compressed and vertically elevated; the dorsal extends along the whole back; the anal occupies the under part of the body, and almost seems to be continued forwards by the ventrals, which are frequently united with it. There are six rays in the branchiæ. They are taken along the coasts of almost all countries, and furnish a wholesome and delicious article of food.

Individuals are sometimes captured, whose eyes are placed on the side opposite to that in which they are generally seen, they are then said to be *contournés*, or reversed; others again have both sides of the body coloured alike, when they are called *doublés* or doubled; it is most generally the brown side which is thus reproduced, though it sometimes happens to the white one.

The subdivisions of this genus include the *Plaice*, *Flounder*, *Sole*, *Turbot*, *Halibut*, &c.

FAMILY III.

DISCOBOLI.

These fishes, so called on account of the disk formed by their ventrals, form two genera.

Lepadogaster, *Gouan.*

The small fishes which compose this genus are remarkable for the following characters. Their ample pectorals having reached the inferior surface of the trunk, assumes stouter rays, curve slightly forwards, and unite with each other on the throat by a transverse membrane directed forwards, which is formed by the union of the ventrals. The body is smooth and without scales, the head broad and depressed, the snout salient and protractile; the branchiæ, but slightly cleft, are furnished with four or five rays, and they have but a single soft dorsal opposite to a similar anal.



Cyclopterus, *Linnæus.*

This genus is well marked by the ventrals, whose rays, suspended round the pelvis, and united by a single membrane, form an oval and concave disk, used by the fish as a sucker, to attach itself to rocks. The mouth is wide, and its jaws and pharyngeals furnished with small and pointed teeth; opercula small; branchiæ closed below, and provided with six rays; pectorals very large, and uniting almost beneath the throat, as if to embrace the disk of the ventrals.

Cyclopterus lumpus, Lin. (The Lumpsucker.) The first dorsal so enveloped

in a thick and tubercular skin, that it has the appearance, externally, of being a simple dorsal hump; there are three ranges of thick conical tubercles on each side of it. It feeds on Medusæ and other gelatinous animals, particularly in the North. Its flesh is soft and insipid; heavy, and with scarcely any means of defence, it becomes the prey of the Seal, Shark, &c. The male is said to keep careful watch over the eggs.

Echeneis, *Linnæus.*

This genus, as well as that of Pleuronectes, might form a particular family in the order of the Malacopterygii Subrachiati. The fishes of which it consists are remarkable for a flattened disk placed upon their head, composed of a certain number of transverse, cartilaginous laminæ, directed obliquely backwards, dentated or spiny on their posterior edge, and moveable; so that by creating a vacuum between them, or by hooking on to various bodies by means of the spines, they are enabled to attach themselves firmly thereto, a circumstance which gave rise to the fabulous saying, that the Remora possessed the power of suddenly stopping a vessel in the middle of its swiftest course.

The species are not numerous; the most common one that inhabits the Mediterranean, *Echen. remora*, Lin., well known by the name of *Remora*, is the shortest, and has but eighteen laminæ in its disk.

ORDER IV.

MALACOPTERYGII APODES.

This order may be considered as forming but a single natural family, that of the

ANGUILLIFORMES,

Fishes with an elongated form, a thick and soft skin, which almost renders its scales invisible, and but few bones. The great genus

Muræna, *Linnæus,*

Is recognised by the little opercula concentrically surrounded by the rays, all of which are enveloped in the skin, which only opens at a considerable distance back by a hole or species of tube; an arrangement which, by more completely protecting the branchiæ, allows these fishes to remain some time out of water without perishing. Their body is long and slender; their scales, as if incrusted in a fat and thick skin, are only distinctly visible after desiccation; they have neither ventrals nor cæca. This genus has been successively separated into five or six genera, which naturalists are compelled to subdivide still more.



ANGUILLA.

Eels are distinguished by the two-fold character of pectoral fins and of branchiæ opening under them on each side.

CONGER, *Cuvier*.

The dorsal commencing close to the pectorals, or even on them; the upper jaw longest in all the known species.

Mur. conger, Lin. (The Conger Eel.) Found in all the seas of Europe; it attains the length of five or six feet, and the thickness of a man's leg; dorsal and anal edged with black; lateral line dotted with whitish. It is not in much request for the table.

MURÆNA, *Thunberg*.

The *Muræna, properly so called*, have no vestige of pectorals; their branchiæ open on each side by a small hole; their opercula are so thin, and their branchiostigal rays so slender and concealed under the skin, that able naturalists have denied their existence.

M. helena, Lin. Common in the Mediterranean; a fish much esteemed by the ancients, who fed it in ponds expressly constructed for that purpose. The history of Vædius Pollio, who caused his transgressing slaves to be flung alive into these ponds as food for the Murænæ, is well known. It attains a length of three feet and more, is mottled with brown and yellowish, and is excessively voracious.

It is immediately after this great genus of the Murænæ that should be placed a newly discovered fish, which is one of the most singular of the whole class; I mean the

SACCOPHARYNX, *Mitchell*,

Whose trunk, susceptible of being so inflated as to resemble a thick tube, terminates in a very long and slender tail, surrounded by an extremely low dorsal and anal, which unite at its point. The mouth, armed with sharp teeth, opens far behind the eyes, which are placed close to the very short point of the snout. The branchial aperture consists in a hole under the pectorals, which are very small.

This fish attains a large size, and appears to be voracious. It has only been seen in the Atlantic Ocean, floating on the surface by the dilatation of its throat.

GYMNOTUS, *Linnæus*[*].

The gills partly so closed by a membrane, as in Anguilla, but opening before the pectorals.

G. electricus, Lin. (The Electrical Gymnotus), which from its almost uniform shape and obtuse head and tail, has also been called the *Electrical Eel*.

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[*] *Gymnotus*, or properly speaking, *Gymnonotus* (Bear-back), a name given to these fishes by Artedi.

It is from five to six feet long, and communicates such violent shocks that men and horses are struck down by them. This power is dependent on the will of the animal, which gives it what direction it pleases, and renders it effective, even at a distance, killing fishes therewith, so situated. It is, however, dissipated by use, and to renew it, the Gymnotus requires rest and nourishing food. The organ which is the seat of this singular faculty, extends along the whole under side of the tail, occupying about half its thickness; it is divided into four longitudinal fasciculi, two large ones above, and two smaller ones below, and against the base of the anal fin. The little cells, or rather the little prismatic and transverse canals formed by the two kinds of laminæ that unite the bundles, are filled with a gelatinous matter, and the whole apparatus receives a proportionably large number of nerves.

Gymnarchus, *Cuvier.*

The body scaly and elongated, and the gills slightly open before the pectorals as in Gymnotus; but a fin, with soft rays, occupies the whole length of the back; and there is none behind the anus, nor under the tail, which terminates in a point. The head is conical and naked, the mouth small, and furnished with a single row of small trenchant teeth.

G. niloticus. The only species known; discovered in the Nile by M. Riffault.

Leptocephalus, *Pennant.*

The branchial aperture before the pectorals; body compressed like a riband; head extremely small, with a short and somewhat pointed snout; pectorals almost imperceptible, or totally wanting; the dorsal and anal hardly visible, and uniting at the point of the tail. The intestines occupy but an extremely narrow line along the inferior edge.

L. morisii, Gm., inhabits the coast of France and England. Several other species, however, are found in the seas of hot climates, all of them as thin as paper, and transparent as glass, so that even the skeleton is not visible. The study of their organisation is one of the most profound, and interesting, to which travellers can devote themselves.

Ophidium, *Linnæus.*

Dorsal and anal fins united with that of the tail, and terminating the body in a point; the body so elongated and compressed that it has been compared to a sword, and invested like that of an eel with small scales planted in the thickness of the skin. The Ophidii, however, differ from eels in their well cleft branchiæ, which are furnished with a very apparent operculum and a membrane with short rays. Their dorsal rays are articulated, but not branched.

Ammodytes, *Linnæus.*

An elongated body like that of the preceding fishes, provided with a fin, having articulated but simple rays, occupying a great part of the back, with

a second behind the vent, and with a third which is forked at the end of the tail; these three fins, however, are separated by free spaces. The snout is acute: the upper jaw susceptible of extension, and the lower one, when at rest, longer than the other.

ORDER V.

LOPHOBRANCHI *.

All the fishes of which we have hitherto spoken, have not only a bony or fibrous skeleton, and complete and free jaws, but their branchiæ are uniformly composed of laminæ, or are pectiniform. In this order, however, we likewise find the jaws free and complete; but it is eminently distinguished by the gills, which, instead of resembling, as usual, the teeth of a comb, are divided into small round tufts, arranged in pairs along the branchial arches, a structure of which no other fishes present any example. They are inclosed beneath a large operculum, tied down on all sides by a membrane which leaves only a single small orifice for the exit of the water, and exhibiting in its thickness only vestiges of rays. These fishes are also recognised by the scutellated plates of mail which cover their body, and usually render it angular. They are generally small, and almost without flesh.

Syngnathus, *Linnæus* †.

The *Syngnathi* constitute a numerous genus, characterised by a tubular snout, formed like that of the Fistularidæ, by the prolongation of the ethmoid, vomer, tympanals, preopercula, subopercula, &c. and terminated by an ordinary mouth, but one that is cleft almost vertically on its extremity. The respiratory aperture is near the nape; and the ventrals are wanting. There is a peculiarity in the production of these fishes, whose ova slip into a pouch formed by an inflation of the skin, and are hatched there; this pouch, in some, is situated under the abdomen, and in others under the base of the tail; it splits spontaneously for the passage of the fry.



There are three subgenera, viz. *Hippocampus* (the Sea-horse), *Solenostomus*, and *Pegasus*.

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* Tufted gills.

† From σὺν and γνάθος (united jaws), a name composed by Artedi, who thought that the tube of the snout of these fishes was formed by the union of their jaws.

ORDER VI.

PLECTOGNATHI*.

We have now passed from the preceding five orders of bony or fibrous fishes, with free and complete jaws, to the sixth, which may be approximated to the Chondropterygii, with which it is allied by the imperfection of the jaws, and the tardy induration of the skeleton; this skeleton, however, is fibrous, and its whole structure is that of ordinary fishes. The most distinguishing character of the order consists in the maxillary bone being soldered to the side of the intermaxillary, which alone constitutes the jaw, and in the mode in which the palatine arch is connected with the cranium, which, being by a suture, consequently renders it immoveable. Besides this, the opercula and rays are concealed under a thick skin, through which only a small branchial fissure is visible. Of ribs, nothing is to be found but very small vestiges. There are no true ventrals.

This order comprises two very natural families, characterised by their mode of dentition.

FAMILY I.

GYMNODONTES†.

The *Gymnodontes* have jaws, which, instead of teeth, are furnished with an ivory substance, internally divided into laminæ, whose *ensemble* resembles the beak of a parrot, and which in fact consists of true teeth united, that succeed each other as fast as they are destroyed by triturition. The opercula are small, and there are five rays on each side, all of which are but imperfectly seen. They live on crustacea and fucus; their flesh is mucous, and that of several species is considered poisonous, at least in certain seasons.



Two of the genera, *Tetraodon* and *Diodon*, have the faculty of swelling themselves up like a balloon, by filling their stomach (or rather a sort of very thin and extensible crop, which occupies the whole length of the abdomen, and adheres closely to the peritoneum), a circumstance which has occasioned it to be considered at one time as the peritoneum itself, and at another as a species of epiploon with air. When thus inflated, they roll over, and float on the surface, with the abdomen upwards, unable to direct their course; but they are extremely well defended while in this position by the erection of the spines with which their skin is everywhere furnished.

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* Cheeks united by suture. † Naked teeth.

Diodon, *Linnæus,*

So called because the jaws are undivided and formed of one piece above and another below. Behind the trenchant edge of each of these pieces, is a round portion, transversely furrowed, which constitutes a powerful instrument of mastication. The skin is everywhere so armed with stout pointed spines, that when inflated, they resemble the burr of a chestnut tree. A number of species inhabit the seas of hot climates.

Tetraodon, *Linnæus.*

Jaws divided in the middle by a suture, so as to present the appearance of four teeth, two above and two below; spines small and low. Several species are said to be poisonous.

Cephalus, *Shaw.*

Jaws undivided as in Diodon; but the body, compressed and spineless, is not susceptible of inflation, and the tail is so short and high that this fish resembles one whose posterior portion has been truncated, producing a singular appearance, that is amply sufficient to distinguish it. A thick layer of a gelatinous substance is spread under the skin.

C. brevis, Sh. (The Short Sunfish.) Four feet and more in length, and weighing upwards of three hundred pounds; the skin is very rough, and of a fine silver colour. It is found in the European seas.

Triodon, *Cuvier.*

We also make a separate genus of these fishes, whose upper jaw is divided as in Tetraodon, and the lower one single, as in Diodon. An enormous dewlap, almost as long as the body, and twice as high, is supported before by a very large bone which represents the pelvis, and approximates them to certain Balistes. Their fins are those of a Diodon, their body is rough as in Tetraodon, and the surface of their dewlap is covered with numerous, small, rough crests, placed obliquely.

T. bursarius, Reinw. The only species known; it was discovered in the Indian Ocean by M. Reinward.

FAMILY II.

SCLERODERMI*.



The second family of the Plectognathi is easily distinguished by a conical or pyramidical snout, prolonged from the eyes, and terminated by a small mouth, armed with a few distinct teeth in each jaw. The skin is usually rough or invested with hard scales; the natatory bladder is oval, large, and strong;—the *Balistes*, Lin. have the body compressed; eight teeth in a single row in each jaw, generally trenchant; the skin scaly or granulated, but not exactly osseous; the first dorsal composed of one or more spines articulated with a particular bone which is attached to the cranium, marked by a furrow into which they are received; the second dorsal long, soft, and placed opposite to a nearly similar anal.

These fishes abound in the torrid zone, near rocks and on the surface of the water, where they display their brilliant colours. Their flesh, which is but lightly esteemed at all times, becomes, it is said, poisonous during the period in which they feed on the coralline Polypi: fucus is all that I met with in those I opened.

B. cariscus, Lin. (The Mediterranean File-Fish.) Brownish grey, spotted with blue, or greenish. Its flesh is not esteemed.

OSTRACION, *Linnæus*.

The head and body of these fishes, instead of scales, are covered with regular bony plates soldered in such a manner as to form a sort of inflexible shield, which invests them, so that the only moveable parts are the tail, fins, mouth, and a sort of small lip with which the edge of their gills is furnished, all passing through holes in this coat of mail.

CHONDROPTERYGII†.

The second series of this class of fishes, or the Chondropterygii, can neither be considered as superior nor inferior to that of the ordinary fishes, for several of its genera approach the reptiles in the conformation of the ear, while in others the organisation is so simple, and the skeleton so much reduced, that we might be excused for hesitating to place them among vertebrate animals, somewhat parallel to the first, as the Marsupialia, for instance, are parallel to the other unguiculated Mammalia.

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* Rough-skinned. † Cartilaginous-finned.

The skeleton of the Chondropterygii is essentially cartilaginous; that is, it contains no osseous fibres, the calcareous matter being deposited in small grains, and not in filaments; hence the absence of sutures in their cranium, which is always formed of a single piece, but in which, by means of projections, depressions, and holes, regions analogous to those in the cranium of other fishes may be distinguished. It sometimes happens that moveable articulations, which are found in other orders, are not met with in this one; part of the vertebræ of certain Rays, for instance, being united in a single body. Some of the articulations of the bones of the face also disappear, and the most apparent character of this division consists in the absence of the maxillaries and intermaxillaries, or rather in their reduction to mere vestiges concealed under the skin, while their functions are fulfilled by bones analogous to the palatines, and even sometimes by the vomer. The gelatinous substance, which in other fishes fills the intervals of the vertebræ, and only communicates with them by a small hole, forms a long chord in several of the Chondropterygii, which traverses the bodies of almost all the vertebræ, without scarcely varying in diameter.

This series is divided into two orders—the Chondropterygii whose branchiæ are free, like those of ordinary fishes; and those in which they are fixed, that is to say, attached to the skin by their external edge in such a manner that the water can only escape from their intervals through holes on the surface.

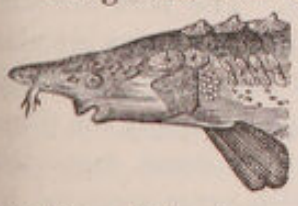
ORDER I.

STURIONES, OR CHONDROPTERYGII BRANCHIIS LIBERIS,

Or *Chondropterygii* with *free branchiæ*, which are still closely allied to the ordinary fishes in their gills, which have but a single wide opening, and are furnished with an operculum, but without rays in the membrane. This order comprises but two genera.

Acipenser, *Linnæus**.

The general form of the *Sturgeon* is similar to that of the Shark, but the



body is more or less covered with bony plates in longitudinal rows; the exterior portion of the head is also well mailed; the mouth, placed under the snout, is small and edentated; the palatine, soldered to the maxillaries, converts them into the upper jaw, and vestiges of the intermaxillaries are found in the thickness of the lips. This mouth, placed on a pedicle that has three articulations, is more protractile than that of a Shark. The eyes and nostrils are on the side of the head, and

* *Acipenser* is the ancient name; *Sturio*, whence *Sturgeon*, is modern, and is probably the German name *Stoer* latinized.

cirri are inserted under the snout. The labyrinth is perfectly formed in the cranial bone, but there is no vestige of an external ear. A hole perforated behind the temple is a mere spiracle, which leads to the branchiæ.

The Sturgeon ascends certain rivers in great numbers, and is the object of important fisheries; the flesh of most species is agreeable, their ova are converted into caviar, and their natatory bladder into isinglass. Western Europe produces—

A. ruthenus, Lin. (The Sterlet.) Seldom more than two feet in length; plates of the lateral rows more numerous and carinated, those of the belly flat. It is considered a delicious fish, and its caviar is reserved for the Russian court. There is reason to believe that it is the *Elops* and the *Acipenser*, so highly celebrated among the ancients.

A. huso, Lin. (The Great Sturgeon.) Blunter plates and a shorter snout and cirri than those of the Common Sturgeon; the skin also is smoother. It is frequently found to exceed twelve and fifteen feet in length, and to weigh more than twelve hundred pounds. One specimen was captured whose weight amounted to near three thousand pounds. The flesh is not much esteemed, and is sometimes unwholesome; but the finest isinglass is made from its natatory bladder. It is also found in the Po. North America has several species of this genus which are peculiar to it.

Spatularia, *Shaw.*

These fishes are recognised at once by the enormous prolongation of their snout, to which its broad borders give the figure of a leaf. Their general form and the position of their fins remind the observer of a Sturgeon, but their gills are still more open, and the operculum is prolonged into a membranous point which extends to near the middle of the body. The mouth is well cleft and furnished with numerous small teeth.

But a single species is known, the Paddle-fish of the Mississippi.

Chimæra, *Linnæus.*

The Chimæræ are closely allied to the Sharks in their general form and in the position of their fins, but all their branchiæ open externally by a single apparent hole on each side, although if we penetrate more deeply, we find that they are attached by a large part of their edges, and that in fact there are five particular holes terminating in the bottom of the common aperture. A vestige of an operculum, however, is concealed under the skin. The jaws are still more reduced than in the Shark, for the palatine and tympanic bones are also mere vestiges suspended to the sides of the snout, and the vomer is the only representative of the upper jaw. Hard and indivisible plates supply the place of teeth, four on the upper jaw and two on the lower. The snout, supported like that of a Shark, projects forwards, and is pierced with pores arranged in tolerably regular lines; the first dorsal, armed with a strong spine, is placed over the pectorals. They produce very large coriaceous eggs with flattened and hairy borders.

C. monstrosa, Lin. (The Arctic Chimæra.) Two or three feet long, of a silvery colour, and spotted with brown. From the Northern and European seas.

ORDER II.

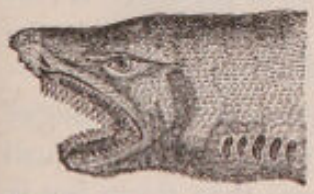
CHONDROPTERYGII BRANCHIIS FIXIS,

Or the *Chondropterygii* with *fixed branchiæ*, instead of having those organs free on the external edge, and opening all their intervals into a large common orifice, as is the case in all the fishes of which we have hitherto spoken, have them adhering by this external edge in such a manner that they permit the water to escape through as many holes pierced in the skin as there are intervals between them, or, at least, that these holes may terminate in a common duct, through which the water is ejected. Another circumstance peculiar to these fishes is the presence of little cartilaginous bows, frequently suspended in the muscles opposite to the external edges of the branchiæ, and which may be termed branchial ribs.

FAMILY I.

SELACHII.

This family, hitherto comprised under two genera, Squalus and Raia, has



many common characters. The palatines and post-mandibularies, alone armed with teeth, supply the place of jaws, the usual bones of which are reduced to mere vestiges; one single bone suspends these apparent jaws to the cranium, representing at once the tympanal, jugal, and temporal bones, and the preoperculum. The hyoid bone is attached to the single pedicle just mentioned, and supports branchiostegal rays, as in ordinary fishes, although they are not so very visible externally; it is followed by the branchial arches, as usual, but neither of the three pieces compose the operculum. These fishes have both pectorals and ventrals: the latter are situated behind the abdomen. Their membranous labyrinth is inclosed by the cartilaginous substance of the cranium; the sac, which constitutes part of it, contains mere amylaceous masses, and not stones.

Squalus, *Linnæus.*

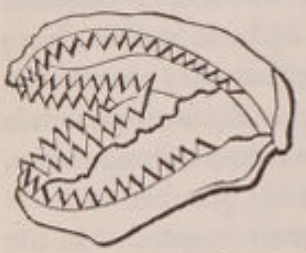
The *Sharks* form a first great genus, distinguished by an elongated body, a thick fleshy tail, and moderate pectorals, so that the general figure approaches that of ordinary fishes; the branchial openings correspond with the sides of the neck, and not with the under surface of the body, as we shall see is the case with the Rays; the eyes also are on the sides of the head. The snout is supported by three cartilaginous branches connected with the anterior part of the cranium, and the rudiments of the maxillaries, intermaxillaries, and premandibularies are evident in the skeleton.

Several are viviparous. The others produce ova invested with a yellow and transparent horn, the angles of which are prolonged into horny cords. The

little branchial ribs are apparent, and there are also small ones along the sides of the spine, which is completely divided into vertebræ. The genus is very numerous, and authorises various subdivisions.

CARCHARIAS, *Cuvier.*

A numerous and by far the most celebrated tribe; with trenchant, pointed teeth, most commonly dentated on the margin. The first dorsal is far before the ventrals, and the second about opposite to the anal. The spiracles are wanting; the nostrils are placed under the middle of the depressed snout, and the last branchial apertures extend over the pectorals.



Sq. carcharias, Lin. (The White Shark.) This species attains the length of twenty-five feet, and is recognised by its teeth, which in the upper jaw nearly form isosceles triangles, with rectilinear and dentated sides. The lower ones consist of narrow points placed on wider bases, terrific weapons, which are the dread of mariners. It would appear that it inhabits every sea; but its name has frequently been applied to other species with trenchant teeth.

SELACHE, *Cuvier.*

In addition to the form of the Squali, and the spiracles of the Galei, is furnished with branchial openings, that are nearly large enough to encircle the neck, and with small conical and unemarginate teeth.

The common species, *Sq. maximus,* Lin. (The Basking Shark), has nothing of the ferocity of the Shark, although it surpasses it as well as all other Squali in size. Individuals have been captured that were more than thirty feet in length. It inhabits the Arctic Seas, but is sometimes driven on the coast of France by the strength of the north-east winds. There are several other subgenera.

A second genus may be formed of the

ZYGŒNA, *Cuvier,*

Which, to the characters of a Carcharias, adds a form of head of which there is no other example in the animal kingdom. It is horizontally flattened and truncated before, the sides extending transversely in branches, which give it a resemblance to the head of a hammer; the eyes are placed at the extremity of the branches, and the nostrils on their anterior edge.

The most common species of the European seas, *Sq. zygæna,* is sometimes twelve feet long.

SQUATINA, *Dumeril.*

Spiracles, but no anal, as in the third division of the Squali, but differing from all of them in the mouth, which is cleft in the end of the snout and not beneath, and in the eyes, which are placed on its dorsal surface and not on the sides. The head is round, the body broad and horizontally flattened, the pectorals large and extending forwards, but separated from the body by a fissure, where

the branchial orifices are pierced; the two dorsals are behind the ventrals, and the caudal is attached both above and beneath. The

Squat. angelus (The Angel Fish), attains a considerable size in the European seas. Its skin is rough, and the edges of the pectorals are furnished with small spines.

Pristis, *Latham**.

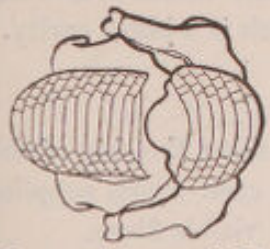
The *Saw Fish* forms a fourth genus. To the elongated form of the Squali, it unites a body flattened before and branchiæ opening below, as in the Rays; but its peculiar character consists in a very long depressed snout, resembling the blade of a sword, armed on each side with stout, bony, trenchant, and pointed spines, planted like teeth. This beak, from which these fishes derive their name, is a most powerful weapon, and with it they attack the largest whales. The true teeth of their jaws resemble small paving stones, like those of a Mustelus.

The common species, *Pristis antiquorum*, Lath., attains a length of twelve or fifteen feet.

Raia, *Linnæus*†.

The *Rays* form a less numerous genus than the Squali. They are recognised by the horizontally flattened body which resembles a disk, from its union with the extremely broad and fleshy pectorals which are joined to each other before or to the snout, and which extend behind the two sides of the abdomen as far as the base of the ventrals. The eyes and spiracles are seated on the dorsal surface, the mouth, nostrils, and orifices of the branchiæ on the opposite one. The dorsal fins are almost always on the tail. The ova are brown, coriaceous, and square, the angles extended into points.





In the various subdivisions of this genus, we find the Sting-Ray, Spotted Torpedo, Thornback, Skate, &c. The most remarkable subgenus is

Torpedo, *Dumeril.*

The tail short, but still tolerably fleshy; disk of the body nearly circular, the anterior border being formed by two productions of the snout, which incline side-wise in order to reach the pectorals; the space between these pectorals, head and branchiæ, is filled on each side with a singular apparatus, formed of little membranous tubes, placed close together like a honeycomb, subdivided by horizontal diaphragms into small cells filled with a sort of mucus, and traversed by numerous nerves proceeding from the eighth pair. It is in this apparatus that resides the electric or galvanic power which has rendered the

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* Πρίστις, saw; the Greek name of this fish.

† *Raia* in Latin, Βατίς and Βατος in Greek, are the ancient names of these fishes.

Torpedo so celebrated; violent shocks are experienced by touching it, and it is most probable that the same power is employed to bewilder its prey. The body is smooth, the teeth small and sharp.

FAMILY II.

SUCTORII.—CYCLOSTOMI, *Dumeril.*



The *Suctorii*, as regards the skeleton, are the most imperfect of fishes, and even of all vertebrated animals. They have neither pectorals nor ventrals; their elongated body is terminated before by a *circular or semicircular fleshy lip*, and the cartilaginous *ring* which supports it results from the soldering of the palatines to the mandibularies. The bodies of all the vertebræ are traversed by a single tendinous cord, filled with a mucilaginous substance without strangulations, which reduces them to the condition of cartilaginous rings, scarcely distinct from each other. The annular portion, a little more solid than the rest, is not however cartilaginous throughout the whole of its circle. They have no ordinary ribs; but the small branchial ones, which are hardly perceptible in the Squali and Rays, are here greatly developed and united with each other, forming a kind of cage, while there are no solid branchial arches. The branchiæ, instead of being pectinated as in all other fishes, resemble purses, resulting from the junction of one face of a branchia with the opposing one of its neighbour. The labyrinth of the ear is inclosed by the cranium, and the nostrils open externally by a single orifice, in front of which is a blind cavity.

PETROMYZON, *Linnæus**.

The *Lampreys* have several branchial openings on each side; the skin of the tail above and beneath is turned up into a longitudinal crest which supplies the place of a fin, but in which the rays resemble scarcely visible fibres.

The maxillary ring of the True Lamprey is armed with strong teeth, and the interior disk of the lip, which is very circular, is furnished with tubercles covered with an extremely hard shell, and similar to teeth. There are two longitudinal rows of small teeth on the tongue, which moves backwards and forwards like a piston; by this, that suction is produced which distinguishes this animal. Water reaches the branchiæ from the mouth by a particular membranous canal, placed under the œsophagus and perforated with holes, that may be compared to a tracheæ. These fishes habitually fix themselves by suction to stones and other solid bodies; they attack the largest fishes in the same way, and are finally enabled to pierce and devour them.

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* *Lamproye*, *Lampreda*, *Lamprey*, corruptions of *Lampetra*, which is itself modern, and, according to some, derived from *Lambendo*, *petras*. *Petromyzon* is the Greek translation of the same, by Artedi.

P. marinus, Lin. (The Sea Lamprey.) Two or three feet in length, marbled with brown on a yellowish ground; two large approximated teeth on the upper part of the maxillary ring. It ascends the mouths of rivers in the spring, and is highly esteemed.

P. fluvialis, Lin. (The River Lamprey.) From a foot to eighteen inches in length; silvery, blackish and olive on the back; first dorsal very distinct from the second; two large separated teeth on the upper part of the maxillary ring. Inhabits rivers, &c.

Myxine, *Linnæus.*

Has but a single tooth on the upper part of the maxillary ring, which is altogether membranous; lateral dentations of the tongue strong, and arranged in two rows on each side, so that the jaws of these fishes seem to be lateral like those of insects or the nereides, which induced Linnæus to place them in the class of Vermes; the rest of their organisation, however, is analogous to that of the lampreys: the tongue also acts like a piston, and the spine of the back is in the form of a cord. The mouth is circular, and surrounded with eight cirri; in its upper margin is a spiracle which communicates with its interior. The body is cylindrical, and furnished behind with a fin that surrounds the tail. There are no vestiges of eyes. The eggs become large. These singular animals pour out such an abundance of mucus through the pores of their lateral line, that the water of the vases in which they are kept seems to be converted into a jelly. They attack and pierce other fishes like the lampreys.

They are subdivided according to the external orifices of their branchiæ.

SECOND GREAT DIVISION OF THE ANIMAL KINGDOM.

ANIMALIA MOLLUSCA*.

The *Mollusca* have neither an articulated skeleton nor a vertebral canal. Their nervous system is not united in a spinal marrow, but merely in a certain number of medullary masses dispersed in different points of the body, the chief of which, termed the brain, is situated transversely on the œsophagus, and envelopes it with a nervous collar. Their organs of motion and of the sensations have not the same uniformity as to number and position, as in the Vertebrata, and the irregularity is still more striking in the viscera, particularly as respects the position of the heart and respiratory organs, and even as regards the structure of the latter; for some of them respire elastic air, and others salt or fresh water. Their external organs, however, and those of locomotion, are generally arranged symmetrically on the two sides of an axis.

The circulation of the Mollusca is always double; that is, their pulmonary circulation describes a separate and distinct circle.

The blood of the Mollusca is white or bluish, and it appears to contain a smaller proportionate quantity of fibrine than that of the Vertebrata. There are reasons for believing that their veins fulfil the functions of absorbent vessels.

Their muscles are attached to various points of their skin, forming tissues there which are more or less complex and dense. Their motions consist of various contractions which produce inflexions and

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* Soft animals.

prolongations of their different parts, or a relaxation of the same, by means of which they creep, swim, and seize upon various objects, just as the form of these parts may permit; but as the limbs are not supported by articulated and solid levers, they cannot advance rapidly, or by leaping.

The irritability of most of them is extremely great, and remains for a long time after they are divided. Their skin is naked, very sensible, and usually covered with a humour that oozes from its pores. No particular organ of smell has ever been detected in them, although they enjoy that sense; it may possibly reside in the entire skin, for it greatly resembles a pituitary membrane. All the Acalepha, Brachiopoda, Cirrhopoda, and part of the Gasteropoda and Pteropoda, are deprived of eyes; the Cephalopoda on the contrary have them at least as complicated as those of the warm-blooded animals. They are the only ones in which the organ of hearing has been discovered, and whose brain is inclosed within a particular cartilaginous box.

Nearly all the Mollusca have a development of the skin which covers their body, and which bears more or less resemblance to a *mantle;* it is often, however, narrowed into a simple disk, formed into a pipe, hollowed into a sac, or extended and divided in the form of fins.

The *Naked Mollusca* are those in which the mantle is simply membranous or fleshy; most frequently, however, one or several laminæ, of a substance more or less hard, is formed in its thickness, deposited in layers, and increasing in extent as well as in thickness, because the recent layers always overlap the old ones.

When this substance remains concealed in the thickness of the mantle, it is still customary to style the animals *Naked Mollusca.* Most generally, however, it becomes so much developed, that the contracted animal finds shelter beneath it; it is then termed a *shell,* and the animal is said to be *testaceous;* the epidermis which covers it is thin, and sometimes desiccated.

The variety in the form, colour, substance, and brilliancy of shells, is infinite; most of them are calcareous; some are horny, but they always consist of matters deposited in layers, or exuded from the skin under the epidermis, like the mucus covering nails, hairs, horns, scales, and even teeth. The tissue of shells differs according to the mode of this deposition, which is either in parallel laminæ or in crowded vertical filaments.

All the modes of mastication and deglutition are visible in the

Mollusca; here the stomachs are simple, there multiple, and are frequently provided with a peculiar armature.

The Mollusca in general appear to be animals that are but slightly developed, possessed of but little industry, and which are only preserved by their fecundity and vital tenacity.

Division of the Mollusca into Six Classes.

The body of some resembles a sac open in front, containing the branchiæ, whence issues a well developed head, crowned with long and strong fleshy productions, by means of which they crawl, and seize various objects. These we term the *Cephalopoda*.

That of others is closed; the appendages of the head are either wanting or are extremely reduced; the principal organs of locomotion are two wings or membranous fins, situated on the sides of the neck, and which frequently support the branchial tissue. They constitute the *Pteropoda*.

Others again crawl by means of a fleshy disk on their belly, sometimes, though rarely, compressed into a fin, and have almost always a distinct head before. We call these the *Gasteropoda*.

A fourth class is composed of those where the mouth remains hidden in the bottom of the mantle, which also incloses the branchiæ and viscera, and is open either throughout its length, at both ends, or at one extremity only. Such are our *Acephala*.

A fifth comprises those which, also inclosed in a mantle and without an apparent head, have fleshy or membranous arms, furnished with cilia of the same nature. We term these *Brachiopoda*.

Finally, there are some which, although similar to the other Mollusca in the mantle, branchiæ, &c., differ from them in numerous horny and articulated limbs, and in a nervous system more nearly allied to that of the Articulata. They will constitute our last class, or that of the *Cirrhopoda*.

CLASS I.

CEPHALOPODA.

Their mantle unites under the body, forming a muscular sac which envelopes all the viscera. In several, its sides are extended into fleshy fins. The head projects from the opening of the sac; it is rounded, furnished with two large eyes, and crowned with longer or shorter conical and fleshy arms or feet, capable of being flexed in every direction, and extremely vigorous, the surface of which is armed with suckers or *cups*, which enable them to adhere with great tenacity to every body they embrace. These feet are their instruments of prehension, swimming, and walking. They swim with the head backwards, and crawl in all directions with the head beneath and the body above.

The *Cephalopoda* have two branchiæ within the sac, one on each side, resembling a highly complicated fern leaf; the great vena cava, having arrived between them, divides into two branches, which pour their contents into two fleshy ventricles, each of which is placed at the base of the branchiæ on its own side, and propels the blood into it.

Respiration is effected by the water which flows into the sac and issues through a funnel placed at its opening.

Between the base of the feet we find the mouth armed with two stout horny jaws resembling the beak of a parrot.

These animals are remarkable for a peculiar and intensely black excretion, with which they darken the surrounding water when they wish to conceal themselves. It is produced by a gland, and held in reserve by a sac, variously situated, according to the species.

Their brain, which is contained in a cartilaginous cavity of the head, gives off a cord on each side, which produces a large ganglion in each orbit, whence are derived innumerable optic filaments; the eye consists of several membranes, and is covered by the skin which becomes diaphanous in that particular spot, sometimes forming folds which supply the want of eyelids. The ear is merely a slight cavity, on each side near the brain, without semicircular canals or an external Meatus, where a membranous sac is suspended which contains a little stone.

The skin of these animals, of the Octopi particularly, changes colour

in places, by spots, with a rapidity which greatly surpasses that of the Chameleon.

These animals are voracious and cruel; possessed both of agility and numerous modes of seizing their prey, they destroy immense quantities of Fish and Crustacea. Their flesh is eaten; their *ink* is employed in painting, and the India, or China ink, is supposed to be made from it.

The Cephalopoda comprise but a single order, which is divided into genera, according to the nature of the shell.

Those which have no external shell, according to Linnæus, formed but the single genus.

Sepia, *Linnæus,*

Or the *Cuttle-fish*, which is now divided into a variety of subgenera, the most interesting of which are the two following:—

Argonauta, *Linnæus.*



These Mollusca are always found in a very thin shell, symmetrically fluted and spirally convoluted, the last whorl so large that it bears some resemblance to a galley of which the spine is the poop. The animal makes a consequent use of it, and in calm weather whole fleets of them may be observed navigating the surface of the ocean, employing six of their tentacula as oars, and elevating the two membranous ones by way of a sail. If the sea becomes rough, or they perceive any danger, the Argonaut withdraws all its arms, concentrates itself in its shell, and descends to the bottom.

Several species are known, closely resembling each other both in the animal and the shell, which were united by Linnæus under the name of *Argonauta argo*, or the *Paper Nautilus.*

Sepia, *Lamarck.*

The Sepiæ, or *Cuttle-fish properly so called*, have two long arms and a fleshy fin extending along the whole length of each side of the sac. The shell is oval, thick, convex, and composed of numerous and parallel calcareous laminæ, united by thousands of little hollow columns, running perpendicularly from one to the other. This structure rendering it friable, causes it to be employed for polishing various kinds of work; it is also given to birds in aviaries, for the purpose of whetting their beaks.

Nautilus, *Linnæus.*

In this genus Linnæus united all spiral, symmetrical, and chambered shells; that is to say, such as are divided by septa into several cavities; their inhabitants he supposed to be Cephalopoda.

This genus is now divided into *Spirula* and *Nautilus proper.*

The Belemnites

Probably belong to this family, but it is impossible to ascertain the fact, as they are only found among fossils; every thing, however, proves them to have been internal shells, thin and double; that is, composed of two cones united at the base, the inner one much shorter than the other, and divided into chambers by parallel septa, which are concave on the side next to the base. A siphon extends from the summit of the external cone to that of the internal one, and continues thence, sometimes along the margin of the septa, and sometimes through their centre. The interval between the two testaceous cones is filled with a solid substance here composed of radiating fibres, and there of self-involving conical layers, the base of each being on the margin of one of the septa of the inner cone.

Of all fossils, Belemnites are the most abundant, particularly in chalk and compact limestone.

The Ammonites,

Or the Cornua-Ammoni, also fossil, are distinguished from the Nautili by their septa, which, instead of being plane or simply concave, are angular and sometimes undulated, but most frequently slashed on the edge like the leaf of an acanthus. The smallness of their last cell seems to indicate that, like the Spirula, they were internal shells. They are very abundant in the strata of secondary mountains, where they are found varying from the size of a lentil to that of a coach wheel. Their subdivisions are based upon the variation of their volutes and siphons.

The Nummulites, *Lamarck*,

Commonly called *Nummulites*, *lenticular stones*, &c., are only found among fossils, and present, externally, a lenticular figure without any apparent opening, and a spiral cavity internally, divided by septa into numerous small chambers, but without a siphon. They constitute the most universally diffused of all fossils, forming entire chains of calcareous hills and immense bodies of building stone.

CLASS II.

PTEROPODA.

The *Pteropoda*, like the Cephalopoda, swim in the ocean, but being deprived of feet, can neither fix themselves to other bodies, nor crawl. Their organs of locomotion consist of fins placed like wings on the two sides of the mouth. But few and small species are known.

Clio, *Linnæus.*

Body oblong, membranous, without a mantle; head formed of two rounded



lobes, whence originate small tentacula; two small fleshy lips, and a little tongue on the front of the mouth; the fins covered with a vascular net-work which acts as branchiæ. Some authors consider them as possessing eyes.

Clio borealis, Lin. This species, which is the most celebrated, is found in astonishing numbers in the Arctic Seas, furnishing, by its abundance, food for the whales, although each individual is hardly an inch long.

Cymbulia, *Péron,*

A cartilaginous or gelatinous envelope, resembling a galley, or rather a sabot or wooden shoe, bristling with small points disposed in longitudinal rows. The animal has two large wings composed of a vascular tissue, which are its branchiæ and fins; between them, on the open side, is a third and smaller lobe with three points.

Pneumodermon, *Cuvier.*

The *Pneumoderma* begin to be a little further removed from the Clios. Their body is oval, without a mantle and without a shell; the branchiæ are attached to the surface and composed of little laminæ arranged in two or three lines, so disposed as to form an H on the part opposite to the head.

Limacina, *Cuvier.*

The body terminates in a spirally convoluted tail, and is lodged in a very thin shell formed by one whorl and a half, umbilicated on one side, and flattened on the other. The animal uses its shell as a boat, and its wings as oars, whenever it wishes to navigate the surface of the deep.

Clio helicina. Almost as common on the Arctic Seas as the *Clio borealis*, and is considered as forming the chief source of food for the whale.

There are three other genera in this class, *Hyalea*, *Cleodora*, and *Pyrgo*, a very small fossil shell.

CLASS III.

GASTEROPODA.

The *Gasteropoda* constitute a very numerous class of the Mollusca, an idea of which is afforded by the Slug.

They generally crawl upon a fleshy disk, situated under the abdomen, which sometimes however assumes the shape of a sulcus, or that

of a vertical lamina. The back is furnished with a mantle which is more or less extended, takes various forms, and in the greater number of genera, produces a shell. Their head, placed anteriorly, is more or less visible, as it is the more or less involved under the mantle; its tentacula are very small, situated above the mouth and do not surround it, varying in number from two to six; sometimes they are wanting; their function is that of touch, or at most that of smell. The eyes are very small, here adhering to the head, and there to the base, side, or point of the tentaculum: sometimes they are wanting. The position, structure, and nature of their respiratory organs vary, and afford the means of dividing them into several families; they never, however, have more than a single aortic heart, that is to say, one placed between the pulmonary vein and the aorta.

Several are entirely naked; others have merely a concealed shell, but most of them are furnished with one that is large enough to receive and shelter them.

The shell is formed in the thickness of the mantle. Some of them are symmetrical and consist of a single piece; others are non-symmetrical, which, in those species where they are very concave, and where they continue to grow for a long time, become obliquely spiral.

If we figure to ourselves an oblique cone, in which other cones, always wider in one direction than in the others, are successively placed, it will be easily seen that the convolution of the whole takes place on the side which enlarges the least.

This part, on which the cone is rolled, is termed the *columella;* it is sometimes solid, and sometimes hollow. When hollow, its aperture is called the *umbilicus*.

The *whorls* of the shell may either remain in one plane, or incline towards the base of the columella.

In this last case the preceding whorls rise above each other, forming the *spire,* which is so much the more *acute,* as the whorls descend more rapidly, and the less they increase in width. These shells with a salient spine are said to be *turbinated.*

When, on the contrary, the whorls remain nearly in the same place, and do not envelope each other, the *spine* is *flat,* or even *concave.* These shells are said to be *discoidal.*

When the top of each whorl envelopes the preceding ones, the *spire* is *hidden.*

The part through which the animal appears to come out is named the *aperture.*

When the whorls remain nearly in the same plane, while the animal

crawls, its shell is vertical, the columella crosswise on the hind part of its back, and its head passes under the edge of the opening opposite to the columella.

When the spire is salient, it inclines from the right side in almost every species; in a very few only does it project from the left when they are in motion; these are said to be *reversed*.

It is observed that the head is always on the side opposite to that to which the spire is directed. Thus it is usually on the left, and in the *reversed* on the right.

The organs of respiration, which are always situated in the last whorl of the shell, receive the ambient element from under its edge, sometimes because the mantle is entirely detached from the body along this edge, and sometimes because it is perforated there.

It sometimes happens that the margin of the mantle is prolonged in a canal, in order to allow the animal to seek the ambient element without protruding its head and foot from its shell.

Most of the aquatic Gasteropoda, with a spiral shell, have an *operculum*, a part sometimes horny, sometimes calcareous, attached to the posterior part of the foot, which closes the shell when its occupant is withdrawn into it and folded up.

Their organs of digestion vary as much as those of respiration.

This class is so numerous that we have been compelled to divide it into a certain number of orders, which we have founded upon the position and form of the branchiæ.

ORDER I.

PULMONEA.

The *Pulmonea* are distinguished from the other Mollusca by respiring elastic air through a hole opening under the margin of the mantle, and which they dilate and contract at will; they have no branchiæ, but a mere net-work of pulmonary vessels which creep over the parietes of the respiratory cavity and chiefly on its ceiling.



Some of them are terrestrial; others are aquatic, but are compelled to visit the surface from time to time for the purpose of opening the orifice of their pectoral cavity, or to respire.

The Terrestrial Pulmonea have generally four tentacula; in two or three only, of a very small size, the lower pair are not to be seen.

Those which possess no apparent shell, form in the Linnæan system the genus

Limax, *Linnæus,*

Which is now divided into *Limax, Arion, Lima, Vaginulus, Testacella,* and *Parmacella.* These animals are known by the common name of *slugs.*

In the terrestrial Pulmonea with complete and apparent shells, the edges of the aperture in the adult are usually tumid.

Helix, *Linnæus.*

To this genus Linnæus referred all those species in which the aperture of the shell, somewhat encroached upon by the projection of the penultimate whorl, assumes a crescent-like figure.

Helix pomatia, Lin., common in the gardens and vineyards of France, with a reddish shell marked with paler bands, an animal which in some places is considered a delicious article of food. The genus is now variously subdivided. The animals are what we term *snails.*

The Aquatic Pulmonea have but two tentacula; they are continually compelled to rise to the surface for the purpose of breathing, so that they cannot inhabit very deep water; they are usually found in fresh water or salt ponds, or at least in the vicinity of the sea coast and of the mouths of rivers. Some of them have no shell, such as those of the genus Onchidium.

The aquatic Pulmonea, with complete shells, were also placed by Linnæus in his genera Helix, Bulla, and Voluta, from which it has been found necessary to separate them.

In the first were comprised the two following genera, where we find the internal edge of the aperture crescent-shaped, as in Helix.

Planorbis, *Brugueir.*

The Planorbes are distinguished from the Helices by the slight increase of the whorls of their shell, the convolutions of which are nearly in one plane, and because the aperture is wider than it is high. It contains an animal with long thin filiform tentacula, at the inner base of which are the eyes, and from the margin of whose mantle exudes a quantity of a red fluid, which is not, however, its blood. In stagnant waters. The

Limnæus, *Lamarck,*

Has, like a Bulinus, an oblong spire and the aperture higher than it is wide; but the margin, like that of a succinea, is not reflected, and there is a longitudinal fold in the columella, which runs obliquely into the cavity. The shell is thin; the animal has two compressed, broad, triangular tentacula, near the base of whose inner edge are the eyes.

They inhabit stagnant waters in great numbers; they also abound with the Planorbes in certain layers of marl or calcareous strata, which they evidently prove were deposited in fresh water.

PHYSA, *Drap.*

The *Physæ* have a shell very similar to that of a Lymnæus, but without the fold in the columella and reflected edge, and very thin. When the animal swims or crawls, it covers its shell with the two notched lobes of its mantle, and has two long, slender, and pointed tentacula, on the greatly enlarged internal base of which are the eyes. They inhabit springs, &c.

AURICULA, *Lamarck.*

Differing from all the preceding aquatic Pulmonea in the columella, which is marked with wide and oblique flutes. Their shell is oval or oblong, the aperture elevated as in Bulinus, and the margin tumid.

CONOVULUS, *Lamarck.*

Projecting folds in the columella, as in the Auriculæ, but the margin of the aperture is not tumid, and the internal lip is finely striated; the general form of the shell is that of a cone, of which the spire forms the base. They inhabit the rivers of the Antilles.

ORDER II.

NUDIBRANCHIATA.

THE Nudibranchiata have no shell whatever; neither are they furnished with a pulmonary cavity, their *branchiæ being exposed* on some part of the back. They are all marine animals, frequently swimming in a reversed position with the foot on the surface, concave like a batteau, and employing the margin of their mantle and their tentacula as oars. In the

DORIS, *Cuvier,*

The branchiæ are arranged in a circle round an opening in the posterior part of the back, under the form of little arbusculæ, the whole resembling a sort of flower. The mouth is a small proboscis, situated under the anterior margin of the mantle, and furnished with two little conical tentacula. The species are numerous, and some of them large. They are found in every sea, where their ova, resembling gelatinous bands, are diffused over stones, sea-weeds, &c.

PLOCAMOCEROS, *Leuck.*

The anterior margin of their mantle is ornamented with numerous branched tentacula.

POLYCERA, *Cuvier.*

The branchiæ, as in Doris, on the hind part of the body, but more simple, and followed by two membranous lamellæ, which cover them in moments of

danger; anterior to the claviform tentacula, similar to those in Doris, are four, and sometimes six others, simply pointed.

TRITONIA, *Cuvier.*

The body and superior tentacula, as in Doris; but the orifices through which the peculiar liquid is excreted, are on the right: the branchiæ, which resemble little trees, are arranged along the sides of the back; and the mouth, provided with broad membranous lips, is armed inside with two horny and trenchant lateral jaws, which may be compared to a pair of sheep-shears.

THETHYS, *Linnæus.*

Two rows of branchiæ resembling branching tufts along the back, and a very large membranous and fringed veil on the head, which shortens as it curves under the mouth; this latter is a membranous proboscis without jaws; on the base of the veil are two compressed tentacula, from whose margin projects a small conical point.

T. fimbria, Lin. Grey, spotted with white; a beautiful species from the Mediterranean.

SCYLLÆA, *Linnæus.*

Body compressed; the foot narrow and marked with a furrow, which enables it to clasp the stems of the fuci; no veil; the mouth resembling a little proboscis; orifices as in Thethys; the compressed tentacula terminated by a cavity, from which issues a little uneven point, and two pairs of membranous crests on the back, the internal surface of which is furnished with pencils of filaments, which are the branchiæ. The middle of the stomach is invested with a fleshy ring, internally armed with horny and trenchant laminæ like knives.

S. pelagica, Lin. Common on all the floating fucus of almost every sea.

GLAUCUS, *Forster.*

Body elongated; having four very small conical tentacula, and on each side three branchiæ, each of which are formed of long slips arranged like the sticks of a fan, which also aid them in swimming. They are beautiful little animals that inhabit the Mediterranean and the Atlantic, prettily coloured with blue and nacre; they swim on their back with great swiftness. Their anatomical structure is very similar to that of the Tritonia, but the species are not well ascertained. The remaining genera are—the Laniogerus, Blainville, which have the body shorter and thicker than the glaucus, but with four similar tentacula; the Eolidia, Cuvier, which resemble small limax informis; the Carolina, Brugueir, with retiform branchiæ arranged in transverse rows



on the back; the Habellina, Cuvier, having radiating retiform branchiæ, supported by five or six pedicles on each side; the Tergipes, Cuvier, having the form of the Eolidia, but with only two tentacula with a range of cylindrical branchiæ on both sides of the back, each terminated by a little sucker or cup, which is used by the animal as feet, to walk on its back. The Busiris, Resso, and the Placobranchus, Van Hasselt, complete the genera; the latter are small Mollusca, inhabiting the Indian Ocean.

The remaining genera of this order are *Laniogerus*, *Eolidia*, *Carolina*, &c.

ORDER III.

INFEROBRANCHIATA.

The Inferobranchiata have nearly the same form and organisation observed in Doris and Tritonia; but their branchiæ, instead of being placed on the back, resemble two long series of laminæ, situated on the two sides of the body, under the projecting margin of the mantle.



Phyllidia, *Cuvier.*

The mantle naked, usually coriaceous, and without any shell; the mouth, a small proboscis, each side of which is furnished with a tentaculum; two others project from above two small cavities in the mantle. Several species inhabit the Indian Ocean.

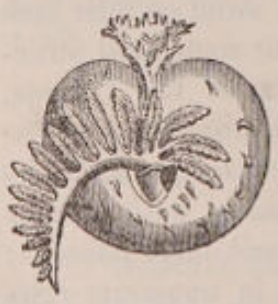
Diphyllidia, *Cuvier.*

The branchiæ similar to those of the Phyllidiæ, but the posterior part of the mantle more pointed; on each side of the semicircular head a pointed tentaculum and a slight tubercle.

ORDER IV.

TECTIBRANCHIATA.

The branchiæ along the right side or on the back, composed of laminæ more or less divided, but not symmetrical; they are more or less covered by the mantle, in which a small shell is generally contained. They approach the Pectinibranchiata in the form of the organs of respiration, and, like them, inhabit the ocean. In the Bursatella, Blumelle, the lateral crests are united in front in such a manner as only to leave an oval aperture for the transmission of water to the branchiæ, which are also deprived of a protecting mantle.



Pleurobranchus, *Cuvier.*

The body equally overlapped by the mantle and by the foot, as if it were between two shields. In some species a little oval calcareous lamina is contained in the mantle, and a horny one in that of others; the mantle is emarginated above the head. The branchiæ are attached along the right side in the furrow, between the mantle and the foot, forming a series of pyramids divided into triangular lamellæ. The mouth, a small proboscis, is surmounted by an emarginated lip, and by two tubular and cleft tentacula.

Various species inhabit both the Mediterranean and the Atlantic, some of which are large and marked with the most beautiful colours.

Pleurobranchæa, *Meckelii.*

The branchiæ situated as in Pleurobranchus; but the foot projects but little, and on the fore part of the former are four short distant tentacula, forming a square that reminds the observer of the anterior disk of the Aceræ. There is no vestige of a shell.

Pleurob. Meckelii. The only species known; from the Mediterranean.

Aplysia, *Linnæus.*

The margin of the foot turned up into flexible crests, surrounding the back, and even susceptible of being reflected over it; the head supported by a neck more or less long; two superior tentacula excavated like the ears of a quadruped, with two flattened ones on the edge of the lower lip; the eyes above the former. The branchiæ are on the back, and consist of highly complicated lamellæ attached to a broad membranous pedicle, covered by a small membranous mantle, in the thickness of which is a flat and horny shell. A limpid humour, secreted by a particular gland, and which in certain species is said to be extremely acrid, is exuded through an orifice below on the right; and from the edges of the mantle oozes an abundant liquid of a deep purple colour, with which, when in danger, the animal tinges the water for a considerable extent. The ova are deposited in a kind of long interlaced glairy net-work, of extreme tenuity. In the seas of Europe we have the

Apl. fasciata, black, margined with lateral red crests, one of the large species; and *Apl. punctata*, Cuv., lilac, sprinkled with greenish points.

Dolabella, *Lamarck.*

The Dolabellæ only differ from Aplysiæ in the position of the branchiæ and their surrounding envelope; they are at the posterior extremity of the body, which resembles a truncated cone. They are found in the Mediterranean and in the Indian Ocean.

Notarchus, *Cuvier.*

The lateral crests united and covering the back, a longitudinal emargination excepted, that leads to the branchiæ, which have no mantle to cover them,

but are otherwise like those of the Aplysiæ; the rest of their organisation is always the same.

Akera, *Muller.*

The branchiæ covered as in the preceding genera, but their tentacula are so shortened, widened, and separated, that they seem to be totally wanting, or rather to form a large fleshy and nearly rectangular shield, under which are the eyes. The shell of such as have any is more or less convoluted, but with little obliquity, and is without a projecting spire, emargination, or canal; the columella, projecting convexly, gives a crescent-like figure to the aperture, the part opposite to the spire being always the broadest and most rounded.

Lamarck names those in which the shell is concealed in the thickness of the mantle, Bullæa. It has but very few whorls, and the animal is much too large to be drawn into it.

Bullæ aperta, Lam. The animal is whitish, and about an inch long; the fleshy shield, formed by the vestiges of its tentacula, the lateral swellings of its foot, and the mantle occupied by the shell, seem to divide its upper surface into four lobes. Its thin, white, semi-diaphanous shell, is nearly all aperture, and its gizzard is armed with three very thick rhomboidal pieces of bone. It is found in almost every sea, where it lives on oozy bottoms. The

Gastropteron, *Meckelii.*

Appears to be an Akera, the margin of whose foot is extended into broad wings, used in natation, which it effects on its back. It has no shell, nor has the stomach any armature; a slight fold of skin is the only vestige of a branchial operculum that is perceptible.

Gastroplax, *Blainville.*—Umbrella, *Lamarck.*

The animal is large and circular; the foot projects considerably beyond the mantle, and its upper surface is studded with tubercles. The viscera are in a round, superior, and central part. The mantle is only visible by its slightly projecting and trenchant edges, along the whole of the front and of the right side. The lamellated pyramidal branchiæ, like those of Pleurobranchus, are under this slight margin. Under this same margin and forwards, are two tentacula, longitudinally cleft, as in Pleurobranchus, at whose internal base are the eyes; between them is a kind of proboscis. There is a large concave space in the anterior margin of the foot, the edges of which are susceptible of being drawn up like the mouth of a purse; and at the bottom of which is a tubercle pierced by an orifice, which perhaps is the mouth, and surmounted by a fringed membrane. The inferior surface of the foot is smooth, and serves the animal to crawl on, as in the other Gasteropoda.

The shell is stony, flat, irregularly rounded, thickest in the middle, with trenchant edges, and marked with slightly concentric striæ.

ORDER V.

HETEROPODA.

The Heteropoda are distinguished by their foot, which, instead of forming a horizontal disk, is compressed into a vertical muscular lamina, which they use as a fin, and on the edge of which, in several species, is a dilatation forming a hollow cone, that represents the disk of the other orders. Their branchiæ, composed of plumiform lobes, are situated on the hind part of the back, directed forwards, and immediately in their rear are the heart and a small liver, with part of the viscera. Their body, a gelatinous and transparent substance lined with a muscular layer, is elongated and usually terminated by a compressed tail. There is a muscular mass belonging to the mouth, and a tongue furnished with little hooks. They usually swim on their back with the foot upwards. They have the faculty of distending their body by filling it with water, in a way not well understood. Forskahl comprised them all in his genus



Pterotrachea.

Which is now divided into *Carinaria, Atlanta, Firola, Timorienna, Monophora, Phylliroe.* The *Argonauta vitrea* of authors must be the shell of a Carinaria, but the animal is not yet known.

ORDER VI.

PECTINIBRANCHIATA.

This order forms, beyond all comparison, the most numerous division, inasmuch as it comprises the whole of the spiral univalves, and several that are simply conical. Their *branchiæ* composed of numerous lamellæ or strips laid parallel with each other, *like the teeth of a comb,* are attached on one, two, or three lines, according to the genus, to the ceiling of the pulmonary cavity, which occupies the last whorl of the shell, and which has a large opening between the edge of the mantle and the body.



In two genera only. *Cyclostoma* and *Helicina,* do we find, instead of branchiæ, a vascular net-work, covering the ceiling of a cavity, that is otherwise similar; they are the only ones that respire the natural air; all the others respire water.

All the Pectinibranchiata have two tentacula and two eyes, sometimes placed

on particular pedicles, and a mouth resembling a more or less elongated proboscis.

Their tongue is armed with little hooks, and by slow and repeated rubbing acts upon the hardest bodies.

The greatest difference in these animals consists in the presence or absence of the little canal formed by a prolongation of the edge of the pulmonary cavity of the left side, and which passes through a similar canal or emargination in the shell, to enable the animal to breathe without leaving its shelter. There is also this distinction between the genera—some of them have no operculum; the species differ from each other by the filaments, fringes, and other ornaments of the head, foot, or mantle.

These Mollusca are arranged in several families according to the form of their shell, which appears to bear a constant relation to that of the animal.

FAMILY I.

TROCHOIDA.

This family is known by the shell, the aperture of which is entire, without an emargination or canal for a siphon of the mantle, as the animal has none, and is furnished with an operculum or some organ in place of it.

Trochus, *Linnæus.*

The external margin of the angular aperture approaching more or less to a perfect quadrangular figure, and in an oblique plane, with respect to the axis of the shell, because the part of the margin next to the spine projects more than the rest. Most of these animals have three filaments on each edge of the mantle, or at least some appendages to the sides of the feet. The

Solarium, *Lamarck.*

Is distinguished from all other Trochi by a very broad conical spire, at the base of which is an extremely wide umbilicus, in which may be seen the internal edges of all the whorls, marked by a crenated cord.

Euomphalus, *Sowerby.*

Fossil shells resembling a Solarium, but wanting the dentations on the internal whorls of the umbilicus. The genus

Turbo, *Linnæus,*

Comprehends all the species with a completely and regularly turbinated shell, and a perfectly round aperture. Close observation has caused them to be greatly subdivided.

These subdivisions are *Delphinula, Pleurotoma, Turritella, Scalaria,* and *Cyclostoma.* The last is terrestrial, and found under moss and stones in woods. The *Valvata,* another subgenus, is found in stagnant water.

It is here that we must place the completely aquatic shells, or those respiring by branchiæ, which belong to the old genus, HELIX; i. e. those in which the penultimate whorl forms, as in the Helices, Lymnææ, &c., a depression which gives the aperture more or less of the figure of a crescent.

The three first genera are still closely allied to Turbo.

PALUDINA, *Lamarck.*

This genus has lately been separated from the Cyclostomæ, because there is no ridge round the aperture of the shell; a small angle to that aperture as well as to the operculum; and finally, the animal, being provided with branchiæ, inhabits the water, like all other genera of this family. It has a very short snout, and two pointed tentacula; eyes at the external base of the latter, but on no particular pedicle, and a small membraneous wing on each side of the fore part of the body. The anterior edge of the foot is double, and the wing of the right side forms a little canal which introduces water into the respiratory cavity, the incipient indication of the siphon in the following family.

The ocean produces some shells which only differ from the Paludinæ in being thick. They form the

LITTORINA, *Ferussac,*

Of which the common species, *Le Vigneau—Turbo littoreus,* Lin., abounds on the coast of France, where it is eaten. The shell is round, brown, and longitudinally streaked with blackish. The

PHASIANELLA, *Lamarck.*

An oblong or pointed shell, similar to that of several Bulini and Lymnææ; the aperture also higher than it is wide, and furnished with a strong operculum; base of the columella sensibly flattened, but no umbilicus.

They inhabit the Indian Ocean, and are much sought for by collectors on account of the beauty of their colours. The animal is provided with two long tentacula, with eyes placed on two tubercles at their external base, and with double lips that are emarginated and fringed, as well as the wings, each of which has three filaments.

AMPULLARIA, *Lamarck.*

A round, ventricose shell, with a short spire, as in most of the Helices; the aperture higher than it is wide, and provided with an operculum; the columella umbilicated.

They inhabit the fresh or brackish waters of hot countries. The animal has long tentacula, and eyes placed on pedicles at their base.

HELICINA, *Lamarck.*

Judging by the shell, the Helicinæ are Ampullariæ in which the margin of the aperture is reflected.

Melania, *Lamarck.*

A thicker shell; the aperture, higher than it is wide, enlarges opposite to the spire; the columella without plicæ or umbilicus; length of the spire very various.

The Melaniæ inhabit rivers, but are not found in France; the animal has long tentacula, the eyes being on their external side, and at about the third of their length.

Tornatella, *Lamarck.*

The shell is elliptical, the spire but slightly salient, the aperture lengthened into a crescent and widened below, and the base of the columella marked by one or two large plicæ or oblique callosities.

Pyramidella, *Lamarck.*

The spire is turreted, the aperture crescent-like and wide, and the base of the columella obliquely contorted and marked with sharp spiral plicæ.

Janthina, *Lamarck.*

The form of the animal separates the Janthinæ from all the preceding genera. Their shell, however, is similar to that of the terrestrial Limaces, the columellar margin being also indented, but slightly angular at the external edge, and the columella somewhat extended beyond the half oval, which, without this prolongation, would be formed by that edge.

The animal has no operculum, but the under surface of its foot is furnished with a vesicular organ resembling a bubble of foam, but composed of a solid substance, which prevents it from crawling, but allows it to float on the surface of the water. The head, a cylindrical proboscis, terminated by a vertically cleft mouth, and armed with little hooks, has a bifurcated tentaculum on each side.

The common species, *Helix janthina*, Lin., has a pretty violet shell, and is very abundant in the Mediterranean. When the animal is touched, it diffuses a thick fluid of a deep violet colour that dyes the surrounding water.

Nerita, *Linnæus.*

The columella of the Neritæ being in a straight line, renders the aperture semi-circular or semi-elliptical. This aperture is generally large in comparison with the shell, but is always furnished with an operculum which completely closes it. The spire is almost effaced, and the shell semi-globular. The genus now forms several subdivisions.

FAMILY II.

CAPULOIDA.

Recent researches have convinced us that it is to the Trochoida that we must approximate this family, which contains five genera, four of which are taken from the Patellæ. They all have a widely opened, scarcely turbinated shell, with neither operculum, emargination, nor syphon; the animal resembles the other Pectinibranchiata. There is but one branchial comb transversely arranged on the roof of the cavity, and its filaments are frequently very long.

Pileopsis, *Lamarck.*

A conical shell with a recurved and spiral summit, which has long caused it to be placed among the Patellæ; the branchiæ are in one range under the anterior margin of the branchial cavity; the proboscis is long, and there is a closely plaited membranous veil under the neck; the eyes are at the external base of the conical tentacula. The

Hipponyx, *Defr.*

Would appear from the shell to be a fossil Pileopsis, very remarkable, however, for a bed, formed of calcareous matter, on which it rests, and which probably exuded from the foot of the animal.

Crepidula, *Lamarck.*

The shell oval, with an obtuse horizontal point, directed obliquely backwards and laterally, the aperture forming the base of the shell, which is half closed beneath and behind by a horizontal plate. The abdominal sac which contains the viscera is on this plate, the foot beneath, and the head and branchiæ forwards. The latter consists of a range of long filaments attached under the anterior margin of the branchial cavity. The eyes are at the external base of two conical tentacula. The genus

Pileolus, *Sowerby,*

Appears to consist of Crepidulæ in which the transverse plate occupies half the aperture; their shell, however, is more like that of a Patella. They are only found fossil.

Navicella, *Lamarck.*

The shell resembles a Crepidula, except that the summit is symmetrical and laid on the posterior margin, and that the horizontal plate is less salient. The animal is also provided with an additional irregularly shaped testaceous plate, horizontally connected with the superior surface of the muscular disk of its foot, and covered by the abdominal sac, which it partially supports.

It is probably analogous to an operculum, but does not exercise its functions, being in a measure situated internally. The animal has long tentacula, at whose external base are pedicles which support the eyes. They inhabit the rivers of hot countries. In the

Calyptræ, *Lamarck*,

We observe a conical shell, in the hollow of which is a little lamina that projects inwards, resembling the commencement of a columella, and that interposes itself between a fold of the abdominal sac. The branchiæ are composed of a range of numerous filaments, long and slender, like hairs.

Siphonaria, *Sowerby*.

The shell of the Siphonariæ, which have recently been separated from the Patellæ, at the first glance seems very similar to a flattened Patella, with radiating sulci; but its margin projects rather more on the right side, and it is excavated beneath by a slight furrow, which terminates at this prominence of the margin, to which there is a corresponding lateral hole in the mantle, for the introduction of water into the branchial cavity, placed on the back, that is closed on every other point. The respiratory organ consists of a few small lamellæ, arranged in one transverse line on the roof of that cavity; the tentacula seem to be wanting, the head being merely furnished with a narrow veil.

Sigaretus, *Adanson*.

The shell is flattened, its aperture ample and round, and the spire very moderate, its whorls rapidly enlarging and seen within, but concealed during the life of the animal in the thickness of a fungous shield, which projects considerably beyond it, as well as the foot, and which is the true mantle. Before this mantle are an emargination and a semi-canal, which serve to conduct water into the branchial cavity, and which form the passage to the following family, but of which there are no impressions on the shell. The tentacula are conical, with the eyes at their external base.

Cryptostoma, *Blainville*.

The shell, resembling that of a Sigaretus, with the head and abdomen, which it covers, supported by a foot four times its size, cut square behind, and forming before a fleshy oblong bundle that constitutes nearly one half of its mass. The animal has a flat head, two tentacula and a broad branchial comb on the roof of its dorsal cavity.

FAMILY III.

BUCCINOIDA.

This family has a spiral shell, in the aperture of which, near the extremity of the columella, is an emargination or a canal for transmitting the siphon or

tube, which is itself but an elongated fold of the mantle. The greater or less length of the canal, when there is one, the size of the aperture, and the form of the columella, furnish the grounds of its division into genera, which may be variously grouped.

Conus, *Linnæus.*

So called from the conical shape of the shell; the spire either perfectly flat, or but slightly salient, forms the base of the cone, the apex being at the opposite extremity; the aperture is narrow, rectilinear, or nearly so, extending from one end to the other without enlargement or fold, either on its edge or on the columella. The thinness of the animal is proportioned to the narrowness of the aperture through which it issues; its tentacula and proboscis are highly protractile; the eyes are placed on the outer side of the former, and near the point; the operculum, situated obliquely on the hind part of the foot, is too narrow and short to close the whole of the aperture.

The shells of this genus, being usually ornamented with the most beautiful colours, are very common in cabinets. The seas of Europe produce very few.

Cypræa, *Linnæus.*

The spire projecting but little, and the aperture narrow and extending from one extremity to the other; but the shell, which is protuberant in the middle, and almost equally narrowed at both ends, forms an oval, and the aperture in the adult animal is transversely wrinkled on each side. The mantle is sufficiently ample to fold over and envelope the shell, which at a certain age it covers with a layer of another colour. The animal has moderate tentacula, with the eyes at their external base, and a thin foot without an operculum.

The colours of these shells, also, are extremely beautiful; they are common in cabinets, though with very few exceptions they all inhabit the seas of tropical countries.

Ovula, *Brugueir.*

The shell is oval, and the aperture narrow and long, as in Cypræa, but without plicæ on the side next to the columella; the spire is concealed, and the two ends of the aperture equally emarginated, or equally prolonged in a canal. The animal has a broad foot; an extended mantle, which partly folds over the shell; a moderate and obtuse snout; and two long tentacula, on which, at about the third of their length, are the eyes.

Terebellum, *Lamarck.*

An oblong shell, with a narrow aperture, without plicæ or wrinkles, and increasing regularly in width to the end opposite the spire, which is more or less salient, according to the species. The animal is not known. The

Voluta, *Linnæus,*

Varies as to the form of the shell and that of the aperture, but is recognised by the emargination without a canal which terminates it, and by the salient and oblique plicæ of the columella. From this genus Brugueir first separated the

Oliva, *Brugueir.*

So named from the oblong and elliptical shape of the shell, the aperture of which is narrow, long, and emarginated opposite to the spire, which is short; the plicæ of the columella are numerous, and resemble striæ; the whorls are sulciform. These shells are quite as beautiful as the Cyprææ.

The animal has a large foot, the anterior part of which (before the head) is separated by an incision on each side; its tentacula are slender, and the eyes are on their side about the middle of their length. The proboscis and siphon are tolerably long; but it has no operculum.

The remainder of the genus Voluta was afterwards divided into five, by Lamarck. They are Volvaria, Voluta, Marginella, Mitra, and Cancellaria.

Buccinum, *Linnæus.*

This genus comprises all the shells furnished with an emargination or a short canal inflected to the left, and in which the columella is destitute of plicæ.

Brugueir has divided them into the four genera of *Buccinum*, *Purpura*, *Cassis*, and *Terebra*, part of which have been again subdivided by Lamarck and de Montfort. The

Buccinum, *Brugueir*,

Includes the emarginated shells without any canal, whose general form as well as that of the aperture is oval. The animals, all such as are known, are deprived of the veil on the head, but are furnished with a proboscis, two separated tentacula, on the external side of which are the eyes, and a horny operculum. Their siphon extends out of the shell.

Nassa, *Lamarck.*

The side of the columella is covered by a more or less broad and thick plate, and the emargination is deep, but without a canal. The animal resembles that of a true Buccinum, and there are gradual transitions among the shells, from one subgenus to the other.

Eburna, *Lamarck.*

A smooth shell without a plicated margin, and a widely and deeply umbilicated columella. The general form of their shell is closely allied to that of the Olivæ. Their animal is unknown.

Ancillaria, *Lamarck.*

The same smooth shell, and at the lower part of the columella a marked lip; there is no umbilicus, neither is the spire sulcated. The animal of several species resembles that of the Olivæ, the foot being still more developed.

Dolium, *Lamarck.*

Those in which projecting ribs, that follow the direction of the whorls, render the margin undulated; the inferior whorl is ample and ventricose.

HARPA, *Lamarck.*

The *Harpæ* are easily recognised by the projecting transverse ribs on the whorls; the last of which forms a lip on the margin. The shell is beautiful, and the animal has a very large foot, pointed behind, and widened in its anterior portion, which is distinguished by two deep emarginations. The eyes are on the sides of the tentacula, and near their base. It has neither veil nor operculum. The

PURPURA, *Brugueir.*

Is known by its flattened columella, which is trenchant near the end opposite to the spire, and which, with the external margin, forms a canal there, sunk in the shell, and not salient. The animal resembles that of a true Buccinum.

The remaining subgenera are *Concholepas*, *Cassis*, *Cassidaria*, and *Terebra.*

CERITHIUM, *Brugueir.*

A shell with a turriculated spire; the aperture is oval, and the canal short, but well marked, and reflected to the left or backwards. The animal has a veil on its head, and is furnished with two separated tentacula, on the side of which are the eyes, and with a round horny operculum. Many are found fossil.

MUREX, *Linnæus.*

This genus comprises all those shells in which there is a salient and straight canal. The animal of each subgenus is furnished with a proboscis, long approximated tentacula, on the external side of which are the eyes, and with a horny operculum; the veil on the head is wanting; and, the length of the siphon excepted, it otherwise resembles that of the Buccina. Brugueir divides them into genera, which have been since subdivided by Lamarck and de Montfort. The

MUREX, *Brugueir,*

Includes all those which have a salient and straight canal, with varices across the whorls.

RANELLA, *Lamarck.*

Characterised by opposing varices, so that the shell is bordered with them on both sides. Their canal is short, and their surface studded with mere tubercles; margins of the aperture plicated. The

FUSUS, *Brugueir.*

Comprises all shells with a salient and straight canal, which are destitute of varices.

TURBINELLA, *Lamarck.*

Also consists of shells with a straight canal, and without varices, distinguishable by the large transverse plicæ on their columella, which extend the

whole length of the aperture, and which closely approximate them to the conical Volutæ; they only differ from the latter in the elongation of their aperture into a sort of canal. The genus

STROMBUS, *Linnæus*,

Includes those shells with a canal that is either straight or inflected towards the right, of which the external margin of the aperture dilates with age, but still preserves a sinus near the canal, under which passes the head of the animal when it extends itself.

In most of them the sinus is at some distance from the canal. They are subdivided by Lamarck into two subgenera, STROMBUS and PTEROCERAS.

ORDER VII.

TUBULIBRANCHIATA.

THE Tubulibranchiata should be detached from the Pectinibranchiata, with which they are very closely allied, because the shell, which resembles a more or less irregularly shaped tube, only spiral at the commencement, attaches itself to various bodies.

VERMETUS, *Adanson*.

A tubular shell, whose whorls, at an early age, still form a kind of spire, but



then continue on in a tube more or less irregularly contorted, or bent like the tubes of a Serpula. This shell usually attaches itself by interlacing with others of the same species, or is partly enveloped by Lithophytes. The animal, having no power of locomotion, is deprived of a foot, properly so called; but the part which in ordinary Gasteropoda forms the tail, is here turned under it, and extends to beyond the head, where its extremity becomes inflated and furnished with a thin operculum; when the animal withdraws into its shell, it is this mass which closes the entrance; it is sometimes seen with various appendages, and in certain species the operculum is spiny.

MAGILUS, *Montfaucon*.

The Magili have a longitudinally carinated tube, which is at first regularly spiral, and then extends itself in a line more or less straight. Although the animal is unknown, it is highly probable that it should be placed near the Vermeti. The

SILIQUARIA, *Brugueir*,

Resembles Vermetus in the head, the position of the operculum, and in the tubular and irregular shell; but there is a fissure on the whole length of this

shell which follows its contour, and which corresponds to a similar cleft in that part of the mantle which covers the branchial cavity. Along the whole side of this cleft is a branchial comb, composed of numerous loose and tabular-like lamellæ.

ORDER VIII.

SCUTIBRANCHIATA.

The Scutibranchiata comprise a certain number of Gasteropoda, similar to the Pectinibranchiata, in the form and position of the branchiæ, as well as in the general form of the body. Their shells are very open, without an operculum, and most of them without the slightest turbination, so that they cover these animals, and particularly their branchiæ, in the manner of a shield. The

Halyotis, *Linnæus*,

Is the only genus of this order in which the shell is turbinated; it is distinguished from that kind of shell by the excessive amplitude of the aperture, and the flatness and smallness of the spire, which is seen from within. This form has caused it to be compared to the ear of a quadruped. In the true Halyotes, the shell is perforated along the side of the columella by a series of holes; when the last hole is not terminated, it gives to that part the look of an emargination. The animal is one of the most highly ornamented of all the Gasteropoda. A double membrane, cut into leaves and furnished with a double range of filaments, extends, at least in the most common species, round the foot and on to the mouth; outside its long tentacula, are two cylindrical pedicles which support the eyes. The mantle is deeply cleft on the right side, and the water, which passes through the shell, penetrates through it into the branchial cavity; along its edges we observe three or four filaments which the animal can protrude through these holes. The mouth is a short proboscis.



In the following genera, which are separated from the Patellæ, the shell is perfectly symmetrical, as is also the position of the heart and branchiæ. In the

Fissurella, *Lamouroux*,

We perceive a broad fleshy disk under the abdomen, as in the Patellæ, a conical shell placed on the middle of the back, but not always completely covering it, and perforated at its summit by a small orifice, which affords a passage to the water required for respiration; this orifice penetrates into the cavity of the branchiæ, situated on the fore part of the back; a cavity other-

wise widely opened above the head. A branchial comb is symmetrically tenarranged on each side; the eyes are on the external base of the conical tentacula, and the sides of the foot are furnished with a range of filaments.

There are two other genera, *Emarginula* and *Parmophorus*.

ORDER IX.

CYCLOBRANCHIATA.

The branchiæ of the Cyclobranchiata resemble small lamellæ, or little pyramids, forming a cordon more or less complete under the borders of the mantle, very nearly as in the Inferobranchiata. Their heart varies as to situation. But two genera of this order are known, in both of which the shell never approaches in the least to the turbinated form.



PATELLA, *Linnæus.*

The entire body covered with a shell, formed of a single piece, in the form of a broad-based cone; a cordon of little branchial lamellæ under the margin of the mantle; the head is furnished with a thick and short snout, and two pointed tentacula, on the external base of which are the eyes; the mouth is fleshy, and contains a spiny tongue, which inclines backwards, and is reflected deeply in the interior of the body.

CHITON, *Linnæus.*

A range of testaceous and symmetrical scales along the back of the mantle, but not occupying its whole breath; edges of the mantle coriaceous, and furnished either with a naked skin or little scales, which give it the appearance of shagreen, or with spines, hairs, or setaceous fasciculi. Under these edges, on each side, is a range of lamellar, pyramidal branchiæ; and before, a membranous veil on the mouth supplies the want of tentacula.

A few small species are found on the coast of France; very large ones abound in the seas of hot climates.

CLASS IV.

ACEPHALA.

The Acephala have no apparent head; but a mere mouth concealed in the bottom, or between the folds of their mantle. The latter is almost always doubled in two, and encloses the body as a book is

clasped by its cover; but it frequently happens, that, in consequence of the two lobes uniting before, it forms a tube; sometimes it is closed at one end, and then it represents a sac. This mantle is generally provided with a calcareous bivalve, and sometimes multivalve, shell, and in two genera only is it reduced to a cartilaginous, or even membranous nature. The brain is over the mouth, where we also find one or two other ganglia. The branchiæ usually consist of large lamellæ covered with vascular meshes, under or between which passes the water; they are more simple, however, in the genera without a shell. From these branchiæ the blood proceeds to a heart, generally unique, which distributes it throughout the system, returning to the pulmonary artery without the aid of another ventricle.

The mouth is always edentated, and can only receive the molecules brought to it by the water.

All the Acephala are aquatic.

ORDER I.

ACEPHALA TESTACEA.

Testaceous Acephala, or Acephala with four branchial leaflets, are beyond



all comparison the most numerous. All the bivalves, and some genera of the multivalves belong to this order. Their body, which contains the liver and viscera, is placed between the two laminæ of the mantle; forwards, and still between these laminæ are the four branchial leaflets, transversely and regularly striated by the vessels: the mouth is at one extremity, and the heart towards the back; the foot, when it exists, is inserted between the four branchiæ. On the sides of the mouth are four triangular leaflets, which are the extremities of the two lips, and serve as tentacula. The foot is a mere fleshy mass, the motions of which are effected by a mechanism analogous to that which acts on the tongue of the Mammalia. Its muscles are attached to the bottom of the valves of the shell. Other muscles, which sometimes form one mass and sometimes two, cross transversely from one valve to the other to keep them closed; but when the animal relaxes these muscles, an elastic ligament placed behind the hinge opens the valves by its contraction.

A considerable number of bivalves are provided with what is termed a *byssus*, or a bundle of threads more or less slender, which issues from the base of the foot, and by which the animal adheres to various bodies. It uses its foot to direct the threads and to agglutinate their extremities; it even reproduces them when cut, but the nature of the production is not thoroughly

ascertained. Réaumur considered these threads as a secretion, spun and drawn from the sulcus of the foot; Poli thinks they are mere prolongations of tendinous fibres.

The shell consists essentially of two pieces, called valves, to which in certain genera are added others, connected by a hinge that is sometimes simple and sometimes composed of a greater or smaller number of teeth and plates, which are received into corresponding cavities.

There is usually a projecting part near the hinge called the *summit*.

Most of these shells fit closely when the animal approximates them; but there are several which exhibit gaping portions either before or at the extremities.

FAMILY I.

OSTRACEA.

The mantle is open, without tubes or any particular aperture.

The foot is either wanting in these Mollusca, or is small. They are mostly fixed by the shell or byssus to rocks and other submerged bodies. Those which are free, seldom move except by acting on the water by suddenly closing their valves.

In the first subdivision there is nothing but a muscular mass reaching from one valve to the other, as seen by the single impression left upon the shell.

It is thought proper to class with them certain fossil shells, the valves of which do not even appear to have been held together by a ligament, but which covered each other like a vase and its cover, and were connected by muscles only. They form the genus

ACARDA. *Brugières*,—OSTRACITA, *La Peyrouse*,

Of which M. de Lamarck makes a family that he names RUDISTA. The shells are thick, and of a solid or porous tissue. They are now divided into the *Radiolites*, *Sphærulites*, *Calceola*, *Hippurites*, *Batolithes*.

As to the well-known living testaceous Acephala, Linnæus had united in the genus

OSTREA,

All those which have but a small ligament at the hinge, inserted into a little depression on each side, and without teeth or projecting plates.

OSSTREA, *Bruguières*.

The *true Oysters* have the ligament as just described, and irregular, inequivalve, and lamellated shells. They adhere to rocks, piles, and even to each other, by their most convex valve.

The animal, PELORIS, *Poli*, is one of the most simple of all the bivalves, possessing nothing remarkable but a double fringe round the mantle, the lobes of which are only united above the head, near the hinge; but there is no vestige of a foot.

Pecten, *Bruguières.*

The *Pectens*, very properly separated from the Oysters by Bruguières, although they have the same kind of hinge, are easily distinguished by their inequivalve semi-circular shell, almost always regularly marked with ribs which radiate from the summit of each valve to the edge, and furnished with two angular productions called *ears*, which widen the sides of the hinge.

Lima, *Bruguières.*

The *Limæ* differ from the Pectens in the superior length of their shell in a direction perpendicular to the hinge, the ears of which are shorter, and the sides less unequal, thus forming an oblique oval. The ribs of most of them are relieved with scales. The Limæ swim with rapidity by means of their valves.

Certain fossils may be placed here which have the hinge, ligament, and central muscle of the Ostreæ, Pectines, and Limæ, but are distinguished by some of the details of the shell. They are *Hinnita*, *Plagiostoma*, *Pachytes*, *Dianchora*, and *Podopsis*.

Although multivalve, we should approximate the

Anomia, *Bruguières,*

To the Ostreæ. The *Anomiæ* have two thin, unequal, irregular valves, the flattest of which is deeply notched on the side of the ligament, which is similar to that of the Ostreæ. The greater part of the central muscle traverses this opening to be inserted into a third plate, that is sometimes stony and sometimes horny, by which the animal adheres to foreign bodies, and the remainder of it (the muscle) serves to join one valve to the other. The animal, Echion, Poli, has a small vestige of a foot, similar to that of a Pecten, which slips between the emargination and the plate that closes it, and perhaps serves to direct water to the mouth, which is close to it.

These shells are found attached to various bodies, like the Ostreæ. They are found in every sea.

Placuna, *Bruguières.*

A small genus allied to the Anomiæ, in which the valves are thin, unequal, and frequently irregular, as in the latter, but both entire.

Spondylus, *Linnæus.*

A rough and foliaceous shell like the Ostreæ, and frequently spiny; but the hinge is more complex; besides the cavity for the ligament, analogous to that of the Ostreæ, there are two teeth to each valve that enter into fossæ in the opposite one; the two middle teeth belong to the most convex valve, which is usually the left one, and which has a projecting heel, flattened, as if sawed through behind the hinge.

The Spondyli are eaten like Oysters. Their shells are frequently tinged with the most brilliant colours. They adhere to all sorts of bodies.

Malleus, *Lamarck.*

A simple pit for the ligament, as in the Ostreæ, where the Mallei were left by Linnæus, on account of their having the same irregular and inequivalve shell. but distinguished by a notch on the side of this ligament for the passage of a byssus.

The most known species, *Ostrea malleus*, Lin., which ranks among the number of high-priced and rare shells, has the two ends of the hinge extended, and forming something like the head of a hammer, of which the valves, elongated in a transverse direction, represent the handle. It inhabits the Archipelago of India.

Vulsella, *Lamarck.*

A little salient plate inside of the hinge of each side, from one of which to the other extends the ligament, otherwise similar to that of the Ostreæ. By the side of this plate is a notch for the byssus, as in the Mallei. The shell is elongated in a direction perpendicular to the hinge.

The most known species inhabit the Indian Ocean.

Perna, *Bruguières.*

Several parallel cavities across the hinge, opposed to each other in the two valves, and lodging as many elastic ligaments; the irregular and foliaceous shell marked on the anterior side and under the hinge by a notch traversed by the byssus. The Pernæ were also left by Linnæus among the Ostreæ. This genus is now subdivided.

In the second subdivision of the Ostracea, as well as in almost all the bivalves which follow, besides the single transverse muscular mass of the preceding genera, there is a fasciculus which is placed before the mouth, and extends from one valve to the other. It is apparently in this subdivision that we must place the

Etheria, *Lamarck.*

Large inequivalve shells, as irregular as those of the Ostreæ, and more so; no teeth to the hinge; the ligament partly external and partly internal. They differ from the Ostreæ in having two muscular impressions. The animal is not seen to produce a byssus.

They have lately been discovered in the Upper Nile.

Avicula, *Bruguières.*

An equivalve shell with a rectilinear hinge, frequently extended into wings by its extremities, furnished with a narrow and elongated ligament, and sometimes with small notches near the mouth of the animal; in the anterior side, a little beneath the angle of the side of the mouth, is a notch for the byssus. The anterior transverse muscle is excessively small.

Mytilus margaritiferus, Lin., has nearly a semicircular shell, greenish without, and ornamented with the most beautiful nacre within. The latter is

employed in the arts, and it is from the extravasation of this substance that are produced the oriental or fine pearls, taken by the divers at Ceylon, in the Persian Gulf, &c.

PINNA, *Linnæus.*

The Pinnæ have two equal valves, forming a segment of a circle, or resembling a half-opened fan, which are closely united by a ligament along one of their sides. The animal, the CHIMÆRA, Poli, is elongated, like its shell; the lips, branchiæ, and other parts are in the same proportion.

The byssus of several species of Pinna is as fine and brilliant as silk, and is employed in fabricating the most precious stuffs. Such is the

P. nobilis, Lin., which is moreover recognised by the valves being roughened with recurved and semitabular plates. It remains half buried in the sand, and anchored by its byssus. In the

ARCA, *Linnæus,*

The valves are equal and transverse, that is to say, the hinge occupies the longest side. It is furnished with a large number of small teeth, which interlock with each other, and, as in the subsequent genera, with two fasciculi of transverse and nearly equal muscles, inserted into the extremities of the valves, which serve to close them.

TRIGONIA, *Bruguières.*

Remarkable for the hinge, which is furnished with two plates en chevron, crenulated on both faces, each of which penetrates into two cavities, or rather between four plates of the opposite side, similarly crenulated on their internal surface.

The living Trigoniæ resemble the Cardiæ in the form of their shell, and the ribs which furrow it: its interior is composed of nacre.

The fossil Trigoniæ are different. Their shell is flattened on one side, oblique, longest in a direction perpendicular to the hinge, and traversed in a contrary direction by a series of tubercles.

FAMILY II.

MYTILACEA.

IN the second family of the testaceous Acephala, the mantle is open before.

All these bivalves have a foot, used in crawling, or at least serving to draw out, direct, and place the byssus. They are commonly known under the generic name of *Muscles*.

MYTILUS, *Linnæus.*

The *true Mytili* or *Sea Muscles* have a closed shell, with equal, convex, and

triangular valves. One of the sides of the acute angle forms the hinge, and is furnished with a long, narrow ligament. The head of the animal is in the acute angle; the other side of the shell, which is the longest, is the anterior one, and allows the passage of the byssus; it terminates in a rounded angle, and the third side ascends towards the hinge, to which it is joined by an obtuse angle. The animal, CALLITRICHE, Poli, has the edges of its mantle provided with branched tentacula near the rounded angle, as it is there that the water enters required for respiration. Before, and near the acute angle, is a small transverse muscle, and a large one behind, near the obtuse angle. Its foot resembles a tongue.

Myt. edulis, Lin. Thy common muscle is frequently seen suspended in extended clusters, along the whole coast of France, to rocks, piles, &c. &c. It forms a considerable item of food, but is dangerous if eaten to excess.

Some of them are found fossil. In the

ANODONTEA, *Bruguières*,

The anterior angle rounded like the posterior; the hinge of the thin and moderately convex shell has no appearance of a tooth whatever, being merely furnished with a ligament which extends along the whole of its length. The animal, LIMNÆA, Poli, has no byssus; its foot, which is very large, compressed and quadrangular, enables it to crawl upon the sand or ooze. The posterior extremity of its mantle is provided with numerous small tentacula. The Anodontes inhabit fresh water.

Several species are found in France, one of which, *Mytilus cygneus*, is common in ponds, &c., with oozy bottoms. Its light and thin shells are used for milk-skimmers, but its flesh is not eaten on account of its insipidity.

UNIO, *Bruguières*.

These Mollusca resemble the Anodonteæ both in their animal and shell, with the exception of their hinge, which is more complex. There is a short cavity in the anterior part of the right valve, which receives a short plate or tooth from the left one, and behind it is a long plate which is inserted between two others on the opposite side. They also inhabit fresh water, preferring running streams.

Numerous species, remarkable for size or form, inhabit the rivers and lakes of the United States. Messrs. Say and Barnes, who have described them, have established some new subgenera among them.

There are certain Marine Mollusca which have a similar animal, and about the same kind of hinge, that should be placed near the Unios; the summits of the shell, however, are more convex, and it is marked by projecting ribs extending from the summits to the edge. They form the

CARDITA, *Bruguières*,

Which are more or less oblong or cordiform, the inferior margin, in some, gaping.

CYPRICARDIA, *Lamarck.*

Carditæ, in which the tooth under the summit is divided into two or three. Their form is oblong, and their sides unequal.

M. de Blainville also separates the

CORALLIOPHAGA, *De Blainville,*

Where the shell is thin, and the lateral plate considerably effaced, which may cause their approximation to Venus.

One of them is known which excavates coralline masses to form its habitation. The

VENERICARDIA, *Lamarck,*

Only differs from the Carditæ in the circumstance that the posterior plate of their hinge is shorter and more transverse, which caused their approximation to Venus; their form is almost round. Judging from the impressions of its muscles on them, their animal must resemble that of the Carditæ and Unios.

Both of them approach the Cardia in the general form and the direction of their ribs. I suspect that this is also the place for the

CRASSATELLA, *Lamarck,*

Which has sometimes been approximated to Mactra, and at others to Venus; the hinge has two slightly marked lateral teeth, and two very strong middle ones, behind which, extending to both sides, is a triangular cavity for an internal ligament. The valves become very thick by age, and the impression made by the margin of the mantle, leads to the belief that there are no protractile tubes.

FAMILY III.

CHAMACEA.

THE mantle closed and perforated by three holes, through one of which passes the foot; the second furnishes an entrance and exit to the water requisite for respiration: the two latter are not prolonged into tubes as in the subsequent family. It only comprises the genus

CHAMA, *Linnæus,*

Where the hinge is very analogous to that of a Unio, that is to say, the left valve near the summit is provided with a tooth, and further back with a salient plate, which are received into corresponding fossæ of the right valve. This genus has necessarily been divided. In the

TRIDACNA, *Bruguières,*

The shell is greatly elongated transversely, and equivalve; the superior angle, which answers to the head and summit, very obtuse.

The animal is very singular, inasmuch as it is not, like most of the others, placed in the shell, but is directed, or, as it were, pressed out before. The anterior side of the mantle is widely opened for the passage of the byssus; a little below the anterior angle is another opening, which transmits water to the branchiæ.

There is but a single transverse muscle, corresponding to the middle of the margin of the valves. In TRIDACNA, Lam., or the Tridacnæ properly so called, the front of the shell as well as of the mantle has a wide opening, with notched edges for the transmission of the byssus, which latter is evidently tendinous, and continues uninterruptedly with the muscular fibres.

Such is the celebrated and enormous shell of India, the *Chama gigas*, Lin.; which is decorated with broad ribs relieved by projecting semi-circular scales. Specimens have been taken that weighed upwards of three hundred pounds. The tendinous byssus which attaches them to the rocks, is so thick and stout that the axe is required to sever it. The flesh, though tough, is edible.

FAMILY IV.

CARDIACEA.

THE mantle is open before, and there are, besides, two separate apertures, which are prolonged in tubes, sometimes distinct, and at others united in one single mass. There is always a transverse muscle at each extremity, and a foot generally used for crawling. It may be considered as a general rule, that those which are furnished with long tubes, live in ooze or in sand. This mode of organisation may be recognised in the shell by the more or less depressed contour described by the insertion of the edges of the mantle previous to its uniting with the impression of the posterior transverse muscle.

CARDIUM, *Linnæus.*

The *Cardia*, like many other bivalves, have an equivalve, convex shell, with salient summits curved towards the hinge, which, when viewing it sidewise, gives it the figure of a heart; hence its name of Cardium, Heart, &c. The animal, CERASTES, Poli, has generally an ample aperture in the mantle, a very large foot forming an elbow in the middle, and with its point directed forwards, and two short or but moderately long tubes.

DONAX, *Linnæus.*

The *Donaces* have nearly the same kind of hinge as the Cardia, but their shell is of a very different form, being a triangle, of which the obtuse angle is at the summit of the valves, and the base at their edge, and of which the shortest side is that of the ligament, or the posterior side, a rare circumstance in this degree, among bivalves. They are generally small, and prettily striated from the summits to the edges; their animal, PERONÆA, Poli, is furnished with long tubes, which are received into a sinus of the mantle. The

CYCLADES, *Bruguières,*

Separated from Venus by Bruguières, like the Cardia and Donaces, has two teeth in the middle of the hinge, and before and behind two salient and sometimes crenulated plates; but the shell, as in several species of Venus, is more or less rounded, equilateral, and transversely striated. The animal has moderate tubes. The external tint is usually grey or greenish. The Cyclades inhabit fresh water.

CORBIS, *Cuvier.*

Marine testaceous Acephala, transversely oblong, which have also stout middle teeth, and well marked lateral plates; their external surface is furnished with transverse ribs, so regularly crossed by rays that it may be compared to wicker-work. In the

TELLINA, *Linnæus,*

There are in the middle, one tooth on the left and two teeth on the right, frequently forked, and at some distance before and behind, on the right valve a plate, which does not penetrate into a cavity of the opposite one. There is a slight plica near the posterior extremity of the two valves, which renders them unequal in that part, where they are somewhat open.

The animal of the Tellinæ, PERONÆA, Poli, like that of the Donaces, has two long tubes, which withdraw into the shell, and are concealed in a duplicature of the mantle.

Their shells are generally transversely striated, and decorated with beautiful colours.

LUCINA, *Bruguières.*

Separated lateral teeth, as in the Cardia, Cyclades, &c., that penetrate between the plates of the other valve; in the middle are two teeth, frequently, but slightly apparent. The shell is orbicular, and without any impression of the retractor muscle of the tube; that of the anterior constrictor, however, is very long.

The living species are much less numerous than those that are fossil; the latter are very common in the environs of Paris.

VENUS, *Linnæus.*

This genus comprises many Testacea, whose general character consists in the teeth and plates of the hinge being approximated under the summit, in a single group. They are usually more flattened and elongated, in a direction parallel to the hinge, than the Cardia. The ribs, when there are any, are almost always parallel to the edges, being directly the reverse of their arrangement in the Cardia.

The animal is always furnished with two more or less protractile tubes, sometimes united, and with a compressed foot, which enable it to crawl. This genus is now divided into *Petricola, Crassina, Cytherea, Capsa, Corbula, Mactra,* &c. The common Clam is a true Venus.

FAMILY V.

INCLUSA.

The mantle open at the anterior extremity, or near the middle only, for the passage of the foot, and extended from the other end into a double tube, which projects from the shell, whose extremities are always gaping. Nearly all of them live buried in sand, stones, ooze or wood. Those of the genus

Mya, *Linnæus*,

Have but two valves to their oblong shell, the hinge of which varies. The double tube forms a fleshy cylinder, and the foot is compressed. The different forms of the hinge have furnished Messrs. Daudin, Lamarck, &c. with various subdivisions, *Lutraria*, *Mya proper*, *Anatina*, *Solemya*, &c.

Here also we find a group of some small and singular genera, such as

Byssomia, *Cuvier*,

Where the oblong shell, which has no marked tooth, has the opening for the foot at about the middle of its edge and opposite the summits. The Byssomiæ penetrate into stone, corals, &c.

A species which is provided with a byssus abounds in the Arctic Ocean.

Hiatella, *Daudin*.

The shell gaping, to allow the passage of the foot, near the middle of its edges; but the tooth of the hinge is better marked than in the preceding genus. Ranges of salient spines are frequently observed on the hind part of the shell. They are found in sand, among Zoophytes, &c.

Solen, *Linnæus*.

The shell only bivalve, oblong or elongated, but the hinge always furnished with salient and well-marked teeth, and the ligament external. In the Solens, properly so called, the shell is cylindrically elongated, and has two or three teeth in each valve near the anterior extremity, where the foot issues. The latter is conical, and enables the animal to bury itself in the sand, which it excavates with considerable rapidity on the approach of danger.

Pholas, *Linnæus*.

The *Pholades* have two broad valves, convex towards the mouth, narrow and elongated on the opposite side, and leaving a large oblique opening at each extremity; their hinge, like that of a true Mya, is furnished with a plate projecting from one valve into the other, and with an internal ligament running from that plate into a corresponding cavity. Their mantle is reflected externally upon the hinge, where it sometimes contains two or three supernumerary

calcareous bodies. The foot issues through the aperture on the side next to the mouth, where it is widest, and from the opposite one project the two tubes, which are united and susceptible of inflation in every direction.

The Pholades inhabit canals, which they excavate, some in ooze and others in stone, like the Lithodomi, Petricolæ, &c. They are much sought for on account of their agreeable flavour.

Teredo, *Linnæus.*

The mantle extended in a tube much longer than the two small, rhomboidal valves, and terminated by two short tubes, the base of which is furnished on each side with a stony and moveable kind of operculum or palette. These Acephala, while quite young, penetrate and establish their habitations in submerged pieces of wood, such as piles, ships' bottoms, &c., perforating and destroying them in every direction. It is thought, that in order to penetrate as fast as it increases in size, the Teredo excavates the wood by means of its valves; but the tubes remain near the opening by which its entrance was effected, and through which, by the aid of its palette, it receives water and aliment. The gallery it inhabits is lined with a calcareous crust which exudes from its body, and which forms a second kind of tubular shell for it. It is a noxious and destructive animal in the seaports of Europe.

Teredo navalis, Lin. This species, which is the most common, and is said to have been introduced into Europe from the torrid zone, has more than once threatened Holland with ruin by the destruction of its dikes. It is upwards of six inches in length and has simple palettes.

Fistulana, *Bruguières.*

Separated from Teredo; the external tube is entirely closed at its larger end, and is more or less like a bottle or club. The Fistulanæ are sometimes found buried in submerged fragments of wood or in fruits, and the animal, like a Teredo, has two small valves, and as many palettes. Recent specimens are only obtained from the Indian Ocean, but they are found fossil in Europe. We should approximate to them the

Gastrochæna, *Spengler,*

Where the shells are deprived of teeth, and their edges being wide apart anteriorly, leave a large oblique opening, opposite to which there is a small hole in the mantle for the passage of the foot. The double tube, which can be retraced completely within the shell, is susceptible of being greatly elongated. It appears that they are certainly furnished with a calcareous tube.

They inhabit the interior of Madrepores, which they perforate.

Two genera of Acephala furnished with tubes, have been detected among fossils, but the first of them, the

Teredina, *Lamarck,*

Has a little hollow on the inside of each of its valves, and a small, free, shield-shaped piece on the hinge. In the second, the

CLAVAGELLA, *Lamarck*,

One of the valves is clasped by the tube, leaving the other, however, free. A single living species is found in the Madrepores of the Sicilian seas, which has been described by M. Audouin.

Some naturalists think we should also place in this family the

ASPERGILLUM, *Lamarck*,

The shell of which is formed of an elongated conical tube, closed at its widest extremity by a disk perforated with numerous small tubular holes; the little tubes of the outer range being longest, form a kind of corolla round it. The reason for aproximating them to the Acephala with tubes is found in the fact that there is a double projection on one part of the cone which really resembles the two valves of the Acephala. The affinity between these little tubes and those which envelope the tentacula of certain Terebella, formerly caused this animal to be referred to the Annulata.

The species most known, *Asper. Javanum*, is seven or eight inches in length.

ORDER II.

ACEPHALA NUDA.

THE *naked Acephala* are not numerous, and are sufficiently removed from the ordinary Acephala to form a distinct class, were such a division considered requisite. Their branchiæ assume various forms, but are never divided into four leaflets; the shell is replaced by a cartilaginous substance which is sometimes so thin that it is as flexible as a membrane. We divide them into two families.

FAMILY I.

SEGREGATA.

THIS family comprises those genera in which the individuals that compose them are *insulated* and without any mutual organic connection, although frequently associating together. In the

BIPHORA, *Bruguières*,—THALIA, *Brown*,—SALPA and DAGYSA, *Gmelin*,

The mantle and its cartilaginous envelope are oval or cylindrical, and open at the two extremities. Muscular bands embrace the mantle and contract the body. The animal moves by taking in water at the posterior aperture, and forcing it out through that near the mouth, so that it is always propelled back-

wards, a circumstance which has led some naturalists into error by causing them to mistake the posterior opening for the true mouth. It usually swims on its back. The branchiæ form a single tube or riband, furnished with regular vessels, placed obliquely in the middle of the tubular cavity of the mantle, in such a manner that it is constantly bathed by the water as it traverses that cavity. The mantle and its envelope when exposed to the sun exhibit the colours of the rainbow, and are so transparent, that the whole structure of the animal can be seen through them: in many they are furnished with perforated tubercles. The animal has been seen to come out from its envelope without appearing to suffer pain.

These animals are very abundant in the Mediterranean and the warmer portions of the ocean, and are frequently phosporescent.

Ascidi, *Linnæus.*—*Theyton* of the Ancients.

The mantle and its cartilaginous envelope, which is frequently very thick resemble sacs every where closed, except at two orifices, which correspond to the two tubes of several bivalves. The branchiæ form a large sac, at the bottom of which are the mouth and the visceral mass. The envelope is much larger than the mouth, which is fibrous and vascular, and on which, between the two tubes, is one of the ganglions. These animals attach themselves to rocks and other bodies, and are deprived of all power of locomotion; the chief sign of vitality which they exhibit, consists in the absorption and evacuation of water through one of their orifices; when alarmed they eject it to a considerable distance. They abound in every sea, and some of them are eaten.



Some species are remarkable for the long pedicle which supports them.

FAMILY II.

AGGREGATA.

The second family consists of animals more or less analogous to the Ascidiæ, but *united in a common mass*, so that they seem to communicate organically with each other, and in this respect to connect the Mollusca with the Zoophytes; but independently of their peculiar organization, these animals, according to the observations of Messrs. Audouin and Milne Edwards, at first live and swim separately, only becoming united at a certain subsequent period, a fact which is in direct opposition to this opinion.

Botryllus, *Gærner.*

An oval form, fixed on various bodies, and united by tens or twelves, like the rays of a star. The branchial orifices are at the external extremities of

these rays, and the opening terminates in a common cavity, which is in the centre of the star. If an orifice be irritated, but a single animal contracts; if the centre be touched they all contract. These very small animals attach themselves to certain Ascidiæ, Fuci, &c.

In some particular species, three or four stars appeared to be piled one on the other.

Pyrosoma, *Peron.*

The Pyrosomæ unite in great numbers, forming a large hollow cylinder, open at one end and closed at the other, which swims in the ocean by the alternate contraction and dilatation of the individual animals which compose it. The latter terminate in a point on the exterior, so that the whole external surface of the tube is bristled with them; the branchial orifices are pierced near these points. A Pyrosoma may thus be compared to a great number of stars of Botrylli strung together, the whole of which is moveable.

The Mediterranean and the Ocean produce large species, the animals of which are arranged with but little regularity. They exhibit a phosphorescent appearance during the night.

A smaller species is also known where the animals are arranged in very regular rings.

The species of the remainder that are known are all fixed, and till now have been confounded with the Alcyonia. The visceral bundle of each individual is more or less extended into the common cartilaginous or gelatinous mass, more or less narrowed or dilated in certain points; but each orifice always forms a little six-rayed star on the surface. We unite them all under the name of

Polyclinum.

Some of them are extended over bodies like fleshy crests. Others project in a conical or globular mass; or expand into a disk comparable to that of a flower or of an Actinia; or are elongated into cylindrical branches supported by slender pedicles, &c.; or form parallel cylinders.

CLASS V.

BRACHIOPODA.

The Mollusca Brachiopoda, like the Acephala, have a bilobed mantle, which is always open. Instead of feet they are provided with two fleshy arms, furnished with numerous filaments, which they can protrude from and draw into the shell. The mouth is between the base of the arms.

All the Brachiopoda are invested with bivalve shells, fixed and immoveable. But three genera are known.

Lingula, *Bruguières.*

Two equal, flat, oblong valves, the summits of which are at the extremity of one of the narrow sides, gaping at the other end, and attached between the two summits to a fleshy pedicle, which suspends them to the rocks; the arms become spirally convoluted previously to entering the shell. It appears that the branchiæ consist of small leaflets, disposed around the internal face of each lobe of the mantle.



But a single species, *Lingula anatina*, Cuv., is known. It inhabits the Indian Ocean, and has thin, horny, and greenish valves.

Terebratula, *Bruguières.*

Two unequal valves united by a hinge; the summit of one, more salient than the other, is perforated to permit the passage of a fleshy pedicle which attaches the shell to rocks, madrepores, other shells, &c. Internally, a small bony piece of frame-work is observed, that is sometimes very complex, composed of two branches which articulate with the unperforated valve, and that support two arms edged all round with a long, close fringe, between which, on the side next to the large valve, is a third, simply membranous and much longer appendage, usually spirally convoluted, and edged, like the arms, with a fine and close fringe. The mouth is a small vertical fissure, between these three large appendages. The principal part of the body, situated near the hinge, contains the numerous muscles which reach from one valve to the other, and between them are the viscera, which occupy but little space.

Numberless Terebratulæ are found, fossil or petrefied, in certain secondary strata of ancient formations. The living species are less numerous.

The shell of some is transversely broader or longer, in a direction perpendicular to the hinge, with an entire or emarginated contour, with two or several lobes; some of them are even triangular; the surface is smooth, sulcated in radii, or veined; they are thick or thin, and even transparent. In several of them, in lieu of the hole in the summit of the thin valve, there is a notch, and this notch is sometimes partly formed by two accessory pieces, &c. It is probable that when better known their animals will present generic differences. Already in the

Spirifer, *Sowerby*,

Two large cones have been recognised, formed of a spiral thread, which appear to have supported the animal. In

Thecidea, *Def.*,

The pedicle seems to have been incorporated with the small valve.

Orbicula, *Cuvier.*

The *Orbiculæ* have two unequal valves, one of which, that is round and conical when viewed by itself, resembles the shell of a Patella; the other is

flat and fixed to a rock. The arms of the animal,—*Criopus*, Poli—are ciliated and spirally recurved like that of the Lingulæ.

CRANIA, *Bruguières*,

Should be approximated to the Orbiculæ. The arms of the animal are also ciliated, but the shells have deep and round internal muscular impressions, that have caused it to be compared to the figure of a skull.

One of them inhabits European seas; *Anomia craniolaris*, Lin. Several are fossil; such as the *Cran. antiqua*, and the others of which M. Hœninghaus has given an excellent monograph.

CLASS VI.

CIRRHOPODA.

LEPAS AND TRITON, *Linnæus*.

THE *Cirrhopoda*, in several points of view, are intermediate between this division and that of the Articulata. Enveloped by a mantle, and testaceous pieces which frequently resemble those seen in several of the Acephala, their mouths are furnished with lateral jaws, and the abdomen with filaments named cirri, arranged in pairs, composed of a multitude of little ciliated articulations, and corresponding to a sort of feet or fins similar to those observed under the tail of several of the Crustacea. Their heart is situated in the dorsal region, and the branchiæ on the sides; the nervous system forms a series of ganglions on the abdomen.



Anatifa.

These cirri, however, may be considered as analogous to the articulated appendages of certain species of Teredo, while the ganglions in some respects are mere repetitions of the posterior ganglion of the bivalves. The position of these animals in the shell is such, that the mouth is at the bottom and the cirri near the orifice. These animals are always fixed. Linnæus comprised them all in one genus, LEPAS, which Brugières divided into two, that have in their turn been subdivided.

ANATIFA, *Bruguières*.

A compressed mantle, open on one side and suspended to a fleshy tube, varying greatly as to the number of testaceous pieces with which it is furnished; twelve pair of cirri, six on each side, those nearest to the mouth being the thickest and shortest. The branchiæ are elongated pyramidal append-

ages that adhere to the external base of the whole of the cirri, or of part of them.

The two principal valves, of the most numerous species (PENTALASMIS, Leach), resemble those of a Mytilus. The Anatifæ adhere to rocks, piles, keels of vessels, &c.

BALANUS, *Bruguières.*

The principal part of the shell of the Balani consists of a testaceous tube attached to various bodies, the aperture of which is more or less closed by two or four valves. This tube is formed of various pieces, which appear to be detached, and separated in proportion as the growth of the animal requires it. The branchiæ, mouth, articulated tentacula, and the tube, differ but little from those of the Anatifæ. In BALANUS properly so called, the tubular portion is a truncated cone formed of six projecting pieces, separated by as many depressed ones, three of which are narrower than the others. Their base is usually formed of a calcareous lamina, and fixed to various bodies. The four valves of their operculum close the orifice exactly.

The rocks, shells, &c., on the coast of Europe, are in a manner covered with a species of Balanus, the *Lepas balanus*, Lin.

Naturalists have separated the *Acastæ*, most of which are found in sponge, the *Coniæ*, Blainv., the *Asemæ*, Ranzani, the *Pyrgomæ*, Savigny, the *Octhosiæ*, Ranzani, the *Creusiæ*, Leach, and the *Diadema*, Ranz.

THIRD GREAT DIVISION OF THE ANIMAL KINGDOM.

ANIMALIA ARTICULATA.

This third general form is as well characterised as that of the Vertebrata; the skeleton is not internal as in the latter, neither is it annihialted as in the Mollusca, the articulated rings which encircle the body, and frequently the limbs, supply the place of it, and as they are usually hard, they furnish to the powers of motion all requisite points of support; so that here, as among the Vertebrata, we find the walk, the run, the leap, natation and flight. Those families only are restricted to crawling which are either deprived of feet, or in which the articulations are membranous and soft. This external position of the hard parts, and the internal one of the muscles, reduce each articulation to the form of a sheath, and allow it but two kinds of motion. When connected with the neighbouring parts by a firm joint, as happens in the limbs, it is fixed there by two points, and can only move by ginglymus, that is, in one single plane, a disposition which requires a greater number of joints to produce the same variety of motion. A greater loss of muscular power is also the result, and consequently more general weakness in each animal, in proportion to its size.

But the parts which compose the body are not always articulated in this way; most generally they are only united by flexible membranes, or they fit into each other, and then their motions are more various, but have not the same force.

The system of organs in which the Articulata resemble each other the most, is that of the nerves.

Their brain, which is placed on the œsophagus, and furnishes nerves to the parts adhering to the head, is very small. Two cords which embrace the œsophagus are extended along the abdomen, and united at certain distances by double knots or ganglia, whence arise the nerves of the body and limbs. Each of these ganglia seems to fulfil the functions of a brain to the surrounding parts, and to preserve their sensibility for a certain length of time, when the animal has been divided. If to this we add, that the jaws of these animals, when they have any, are always lateral, and move from without inwardly, and not from above downwards, and that no distinct organ of smell has hitherto been discovered in them, we shall have expressed all that can be said of them in general. The existence, however, of the organs of hearing, the existence, number, and form of those of sight, the kind of respiration, the existence of the organs of circulation, and even the colour of the blood, present great differences, which must be noticed in the various subdivisions.

Distribution of the Articulata into Four Classes.

The Articulata, whose mutual relations are as varied as numerous, present, however, four principal forms, either internal or external.

The ANNULATA, Lam., or RED-BLOODED WORMS, Cuv., constitute the first. Their blood, which is generally red, like that of the Vertebrata, circulates in a double and closed system of arteries and veins, sometimes furnished with one or several visible hearts or fleshy ventricles. Respiration is performed in organs which are sometimes developed externally, and at others remain on the surface of the skin, or dip into its interior. Their body, more or less elongated, is always divided into numerous rings, the first of which, called the head, scarcely differs from the rest, except in the presence of the mouth and the principal organs of the senses. The branchiæ of several are uniformly distributed along their body or on its middle; in others, which are generally those that inhabit tubes, they are all placed anteriorly. They never have articulated feet, but most of them, in lieu thereof, are furnished with setæ or fasciculi of stiff and moveable hairs. The organs of their mouth sometimes consist of jaws, more or less strong, and at others of a simple tube, those of the external senses in fleshy and sometimes articulated tentacula, and in certain blackish points considered as eyes, but which do not exist in all the species.

The CRUSTACEA constitute the second form or class of articulated animals. They are provided with articulated and more or less complex limbs, attached to the sides of the body. Their blood is white: it

circulates by means of a fleshy ventricle placed in the back, which receives it from the branchiæ, situated on the sides of the body, or under its posterior portion, and to which it returns by a ventral and sometimes double canal. In the last or lower species, the heart or dorsal ventricle is itself extended into a tube. They all have antennæ or articulated filaments inserted in the forepart of the head, usually four in number, several transverse jaws and two compound eyes. A distinct ear is only to be found in some species.

The ARACHNIDES form the third class of the Articulata. Their head and thorax, as in many of the Crustacea, are united in one single piece, furnished, on each side, with articulated limbs; but their principal viscera are inclosed in an abdomen connected to the posterior portion of that thorax. Their mouth is armed with jaws, and their head furnished with ocelli, that vary as to number, but the antennæ are always wanting. Their circulation is effected by a dorsal vessel, which gives off arterial branches, and receives venous ones from them; but their mode of respiration varies, some of them still having true pulmonary organs which open on the sides of the abdomen, while others receive air by tracheæ, like insects. In both of them, however, we observe lateral openings or true stigmata.

The INSECTA constitute the fourth class of the Articulata, and the most numerous of all the animal kingdom. With the exception of some genera, the Myriapoda, in which the body is divided into numerous and nearly equal parts, it is always divided into three portions: the *head*, furnished with the antennæ, eyes and mouth; the *thorax*, to which are appended the feet and wings, when they exist; and the *abdomen*, which is suspended behind the thorax, and contains the principal viscera. Those which have wings only receive them at a certain age, and frequently pass through two more or less different forms before they assume that of the winged insect. In all their states they respire by tracheæ; that is, by elastic vessels which receive air through stigmata pierced on their sides, and distribute it by infinite ramifications to every part of the body. A vestige only of a heart is perceptible, consisting of a dorsal vessel which experiences an alternate contraction and dilatation, but to which no branch has ever been discovered, so that we are forced to believe that nutrition is effected in this class of animals by imbibition. It is, probably, this sort of nutrition which necessitated the kind of respiration proper to insects; for as the nutritive fluid is not contained in vessels, and could not be directed towards pulmonary organs in search of air, it was requisite that this air should be diffused throughout the body to reach the fluid. This

is also the reason why insects have no secretory glands, but are provided with mere spongy vessels, which, by the extent of their surface, appear to absorb the peculiar juices they are to produce, from the mass of the nutritive fluid.

Insects vary infinitely as to the form of the organs of the mouth, and those of digestion, as well as in their industry and mode of life.

The Crustacea and Arachnides were long united with the Insecta under one common name, and resemble them in many points of their external form, in the disposition of their organs of motion, and of the sensations, and even in those of manducation.

CLASS I.

ANNULATA.

The *Annulata* are the only invertebrate animals that have red blood. It circulates in a double system of complicated vessels.

Their nervous system consists in a double knotted cord, like that of insects.

Their body is soft, more or less elongated, and divided frequently into a considerable number of segments, or at least of transverse plicæ.

They nearly all inhabit the water—the Lumbrici or Earth-worms excepted; several penetrate into holes at the bottom, or construct tubes there with the ooze or other matters, or even exude a calcareous substance, which envelopes them with a sort of tubular shell.

Division of the Annulata into Three Orders.

This class, which contains but few species, presents a sufficient basis of division in its organs of respiration.

The branchiæ of some resemble tufts or arbusculæ, attached to the head or anterior part of the body: they nearly all inhabit tubes. We will call them the Tubicola.

Those of others resemble trees, tufts, laminæ, or tubercles, in which vessels ramify, and are placed on the middle of the body: most of them inhabit mud or swim in the ocean, the smaller portion being furnished with tubes. We name them the Dorsibranchiata.

Others again have no apparent branchiæ, and respire, either by the

surface of the skin, or as some authors opine, by the internal cavities. Most of them live free in mud or water; some of them only, in humid earth. They are the ABRANCHIATA.

The genera of the first two orders are all furnished with stiff setæ, of a metallic colour, that issue from their sides, sometimes simply, and at others in fasciculi, which serve in lieu of feet; but there are some genera in the third order which are deprived of that support.

The head of the Annulata of the two first orders is generally furnished with tentacula or filaments, to which, notwithstanding their fleshy nature, some modern naturalists give the name of antennæ; and several genera of the second and third are marked with black and shining points, usually considered as eyes. The organisation of their mouth varies greatly.

ORDER I.

TUBICOLA.

SOME of the Tubicola form a calcareous, homogeneous tube, probably the result of transudation, like the shell of the Mollusca, with which, however, they have no muscular adhesion; others construct one by agglutinating grains of sand, fragments of shells and particles of mud, by means of a membrane, also unquestionably transuded; the tube of others again is entirely membranous or horny. To the first belongs the genus

SERPULA, *Linnæus.*

The calcareous tubes of the Serpulæ twine round and cover stones, shells, and all submarine bodies. The section of these tubes is sometimes round, and sometimes angular, according to the species.

The body of the animal is composed of numerous segments; its anterior portion is spread into a disk, armed on each side with several bundles of coarse hairs, and on each side of its mouth is a tuft of branchiæ, shaped like a fan, and usually tinged with bright colours. At the base of each tuft is a fleshy filament, one of which, either on the right or left, indifferently, is always elongated, and dilated at its extremity into a variously formed disk, which serves as an operculum, and seals up the orifice of the tube when the animal has withdrawn into it.

Serp. contortuplicata. The most common species; its tubes are round, three lines in diameter, and twisted. The operculum is infundibuliform, and the branchiæ are frequently of a beautiful red colour, or variegated with yellow, violet, &c. Vases or other objects thrown into the sea are soon covered by its tubes.

Sabella, *Cuvier.*

The same kind of body, and similar flabelliform branchiæ, as the Serpulæ; but the two fleshy filaments adhering to these branchiæ both terminate in a point, and without forming an operculum; sometimes they are even wanting. The tube of the Sabellæ is most commonly composed of granules of clay or mud, and is rarely calcareous.

The species known are large, and their fan-like branchiæ remarkable for their delicacy and brilliancy.

Sab. protula, Cuv. A large and splendid species inhabiting the Mediterranean. Its tube is calcareous, like that of the Serpulæ, its branchiæ orange-coloured, &c.

Terebella, *Cuvier.*

The *Terebellæ*, like most of the Sabellæ, inhabit an artificial tube, but it is composed of grains of sand and fragments of shells; their body, moreover, has fewer rings, and their head is otherwise decorated. Numerous filiform and extremely extensible tentacula surround their mouth; their branchiæ, placed on the neck, are not infundibuliform, but resemble arbusculæ.

Amphitrite, *Cuvier.*

The *Amphitrites* are easily recognised by the golden coloured setæ, arranged like a crown, or the teeth of a comb, in one or two rows, on the anterior part of their head, where they probably serve as a means of defence, or perhaps enable the animal to crawl, or to collect the materials of its tube. Numerous tentacula encircle the mouth, and on each side of the fore part of the back are pectiniform branchiæ.



Some of them construct light tubes of a regular conical figure, which they carry about with them. Their gilded setæ form two combs, whose teeth incline downwards. Their capacious and frequently flexed intestine is usually filled with sand. Such is *Amph. auricoma Belgica* of Gmelin, the tube of which is two inches long and formed of variously coloured round granules. There are other amphitrites which inhabit artificial tubes, fixed to various bodies, their gilded seta form several concentric crowns on their head, from which results an operculum that seals up their tube when they contract, but the two parts of which can separate; each foot is presented with a cirrus. The body is terminated behind in a tube, but towards the head. This species is found on the coast of France, and is represented in the engraving.

Syphostoma, *Otto.*

On the superior part of each articulation, is inserted a fasciculus of fine setæ, and on the inferior a simple seta, and on the anterior extremity two fasciculi of strong golden coloured setæ. Under these setaceous appendages is the mouth, preceded by a sucker surrounded by numerous soft filaments, which may very possibly be branchiæ, and accompanied by two fleshy tentacula. The knotted

medullary cord is seen through the skin. They live buried in mud. Hitherto, the genus

Dentalium, *Linnæus,*

Has always been placed in this vicinity. The shell is an elongated, arcuated cone open at both ends, and has been compared to the tusk of an elephant in miniature. The recent observations of M. Savigny, and those of M. Deshayes especially, have, however, rendered this classification extremely doubtful.

ORDER II.

DORSIBRANCHIATA.

The organs of the *Dorsibranchiata,* and the branchiæ in particular, are equally distributed along the whole of the body, or at least of its middle portion.

At the head of the order we will place those genera in which the organs are most completely developed.

Arenicola, *Lamarck.*

Branchiæ, resembling small trees, on the rings of the middle part of the body only; the mouth, a fleshy and more or less dilatable proboscis, and neither teeth, tentacula, nor eyes visible. The posterior extremity not only wants the branchiæ, but the setaceous fasciculi with which the rest of the body is furnished; the cirri totally deficient.

Aren. piscatorum, Lam. Very common in the sand on the sea shore, where it is disinterred by the fishermen, who use it as bait. It is about a foot long, of a reddish colour, and diffuses an abundant yellowish liquid when touched. It has thirteen pairs of branchiæ.

Amphinome, *Bruguières.*

A pair of more or less complex, tufted or plumose branchiæ on each ring of the body, and to each of the feet two fasciculi of separate setæ, and two cirri; no jaws to the proboscis. The Amphinomes are divided by M. Savigny into Chloeia, in which the head is furnished with five tentacula, the branchiæ resembling a tripinnate leaf. Of these the Indian ocean produces one very remarkable for its long bundles of lemon-coloured setæ, and the beautiful purple plumes of its branchiæ. Into Pleione, where with the same tentacula the branchiæ are tufted, also from the Indian ocean; some of them very large; Euphrosine, where the head has but a single tentaculum, and the tree-like branchiæ complex and much developed; and into Hipponæ, which has no caruncle, and but a single bundle of sitæ, and a single cirrus to each foot.



EUNICE, *Cuvier.*

The branchiæ are also plumose, but the proboscis is well armed with three pairs of differently formed horny jaws; each foot is furnished with two cirri and a bundle of setæ; there are five tentacula above the mouth and two on the nape. In some species only do we find two small eyes.

Eun. gigantea, Cuv. The largest of the known Annulata, being upwards of four feet in length. From the sea of the Antilles.

After these genera with complex branchiæ, we may place those where they are reduced to simple laminæ or slight tubercles, or in which they are even replaced by cirri.

Some of them are still allied to the Eunices, by the strong armature of their proboscis, and their azygous antennæ. Such is the

LYSIDICE, *Cuvier,*

Where, with jaws similar to those of the Eunices, and even more numerous and frequently azygous, the only branchiæ consist of three tentacula and the cirri.

AGLAURA, *Savigny.*

The jaws of the *Aglauræ* are also numerous and azygous, consisting of seven, nine, &c.; but their tentacula are either wanting or completely concealed; the branchiæ are also reduced to cirri.

NEREIS, *Cuvier.*

The true *Nereides* have an even number of tentacula, attached to the sides of the base of the head, and a little further forwards two others that are biarticulate, between which are two simple ones. Their branchiæ consist of small laminæ between which is spread a net-work of vessels; each foot is also furnished with two tubercles, two fasciculi of setæ, one cirrus above, and another beneath.

In the vicinity of these Nereides are grouped several genera in which the body is also slender, and the branchiæ are reduced to simple laminæ, or even simple filaments or tubercles. The jaws or tentacula are wanting in some of them.

PHYLLODOCE, *Savigny.*

The *Phillodoces*, like the true Nereides, have an even number of tentacula on the sides of the head, and four or five small additional ones before. They are furnished with eyes; their large proboscis, which is studded with a circle of very short fleshy tubercles, presents no jaws, and, what particularly distinguishes them, their branchiæ resemble broad leaves, arranged in a single row on each side of the body, and overlapping each other; finely ramified vessels are distributed over them.

ALCIOPA, *Audouin* and *Milne Edwards.*

The mouth and tentacula nearly similar to those of the Phyllodoces; but the feet, independently of the tubercle which supports the setæ and the two

foliaceous cirri or branchiæ, are furnished with two branchial tubercles which occupy their superior and inferior edges.

Spio, *Fabricius* and *Gmelin.*

The body slender; two very long tentacula which have the appearance of antennæ; eyes in the head and on each side of every segment of the body; branchiæ in the form of a simple filament. They are small worms from the Arctic Ocean that inhabit membranous tubes.

Syllis, *Savigny.*

An odd number of tentacula articulated like the beads of a rosary, as well as the superior cirri of the feet, which are simple and have but a single bundle of setæ. It appears that there is some variety of opinion relative to the existence of the jaws.

Glycera, *Savigny.*

The *Glyceræ* are recognised by their head, which is a fleshy, and conical point, resembling a small horn, and divided at the summit into four scarcely visible tentacula. The proboscis of some still presents jaws; in others, they are said to be imperceptible.

Nephthys, *Cuvier.*

The proboscis of the Phyllodoces, but no tentacula; two bundles of widely separated setæ on each foot, between which is a cirrus.

Lumbrinera, *de Blainville.*

The tentacula wanting; but a single small forked tubercle, from which issues a little bundle of setæ, on each articulation of the elongated body. If there be any external organ of respiration, it can only consist of an upper lobe of this tubercle.

Aricia, *Savigny.*

The teeth and tentacula wanting; two ranges of lamellated cirri on the back of the elongated body; anterior feet furnished with notched crests not found on the others.

Hesione, *Lamarck.*

A short thick body composed of but few and feebly marked rings; a very long cirrus, that probably exercises the functions of branchiæ, on the top of each foot, which has another beneath with a bundle of setæ; a large proboscis with neither tentacula nor jaws.

Several species are found in the Mediterranean.

Ophelina, *Savigny.*

The body thick and short, with feebly marked rings and scarcely visible setæ; long cirri in lieu of branchiæ on two thirds of its length; palate of the

mouth with a dentated crest; the lips surrounded with tentacula, of which the two superior are the largest.

Cirrhatulus, *Lamarck.*

The branchiæ consisting of a very long filament; two small bundles of setæ to each of the articulations of the body, which are numerous and compact; a series of long filaments round the nape. The slightly marked head has neither tentacula nor jaws.

Palmyra, *Savigny.*

The *Palmyræ* are recognised by their superior fasciculi, the setæ of which are large, flattened, flabelliform, and glisten like highly-polished gold; their inferior fasciculi are small; their cirri and branchiæ feebly marked. They have an elongated body, two extended tentacula, and three very small ones.

Palm. aurifera, Sav. The only species known; it is from one to two inches in length, and is found at the Isle of France.

Aphrodita, *Linnæus.*

This genus is easily known by the two longitudinal ranges of broad membranous scales that cover the back, to which, through a very groundless assimilation, the name of elytra has been given, and under which their branchiæ, in the form of fleshy crests, are concealed.

Their body is usually flattened, and shorter and broader than in the other Annulata. Their extremely thick and muscular œsophagus is susceptible of being protruded like a proboscis. M. Savigny distinguishes

Halithea, *Savigny,*

Where there are three tentacula, a small crest between two of them, and where the jaws are wanting.

A species is found on the coast of France, which, with respect to its colouring, is one of the most splendid of all animals—the *Aphrodita aculeata*, Lin. It is oval, from six to eight inches in length, and from two to three in breadth. The scales on its back are covered and concealed by a sort of stuff resembling tow, which arises from the sides. From the latter also spring groups of stout spines, which partly transfix the tow, and fasciculi of flexuous setæ of a splendid golden colour, whose changeable tints rival those of the rainbow. They are not inferior in beauty to the plumage of the Humming-bird, or to the lustre of the richest gems. Farther down is a tubercle from which arise three groups of spines, of as many different diameters, and finally, a fleshy cone. There are forty of these tubercles on each side, and between the two first are two small fleshy tentacula. There are fifteen pairs of wide, and sometimes inflated, scales on the back, and fifteen small branchial crests on each side.

Polynoe, *Savigny.*

Where there is none of this tow on the back they have five tentacula, and their proboscis is furnished with strong and horny jaws.

This is the only situation we can assign to a new and very singular genus, which I call

Chætopteros, *Cuvier.*

The mouth has neither jaws nor proboscis, and is furnished above with a lip, to which are attached two tentacula. Next comes a disk with nine pairs of feet, followed by a pair of long silky fasciculi resembling wings. The lamellated branchiæ are rather beneath the body than above it, and extend along its middle.

Chætopterus pergamentaceus, Cuv. This species, which is found at the Antilles, is from eight to ten inches in length, and inhabits a tube resembling parchment.

ORDER III.

ABRANCHIATA.

The *Abranchiata* have no apparent external organ of respiration whatever, and appear to respire, some, like the Lumbrici, by the entire surface of the skin, and others, like the Hirudines, by internal cavities. They have a closed circulating system, usually filled with red blood, and like all the Annulata, a knotted nervous cord. Some are also provided with setæ which enable them to crawl, and others are deprived of them. This has caused their division into two families.

FAMILY I.

ABRANCHIATA SETIGERA.

This first family comprises the Lumbrici and Naides of Linnæus.

Lumbricus, *Linnæus.*

The *Earth-worms*, as they are commonly called, characterised by a long, cylindrical body, divided by rugæ into a great number of rings, and by an edentated mouth, necessarily required to be subdivided.

Lumbricus, *Cuvier.*

Eyes, tentacula, branchiæ and cirri, all wanting. The nervous cord is nothing more than a crowded suite of numerous little ganglia.

Every one knows the *Common Earth-worm—Lumbricus terrestris*, Lin., with a reddish body, that attains nearly a foot in length, and which is composed of upwards of one hundred and twenty rings. Under the sixteenth ring are two pores, the use of which is unknown.

This animal traverses the soil in every direction, and swallows a quantity of earth. It also eats roots, ligneous fibres, animal fragments, &c.

Nais, *Linnæus.*

The *Naides* have an elongated body, the rings of which are less distinct than in the Lumbrici. They inhabit holes made by them in the ooze, from which one half of their body projects and is constantly in motion. Black points are observed on the head of some of them, which may be taken for eyes. They are small worms, whose power of reproduction is as astonishing as that of the Hydræ. Several species are found in the rivers, &c. of France.

Climena, *Savigny.*

The *Clymenæ* also appear to belong to this family. Their thick body has but few rings, which are mostly furnished with stout setæ; a little higher, and near the back, is a bundle of finer ones. There are neither tentacula nor appendages to the head. Their posterior extremity is truncated and radiated. They inhabit tubes.

FAMILY II.

ABRANCHIATA ASETIGERA.

The second family consists of two great genera, both of which are aquatic.

Hirudo, *Linnæus.*

Leeches have an oblong, sometimes depressed, transversely plicated body; the mouth is encircled by a lip, and the posterior extremity furnished with a flattened disk, both of which are well adapted for adhering to bodies by a sort of suction, and are the principal organs of locomotion possessed by these animals; for after extending itself, the Leech fixes its anterior extremity and approximates the other, which in its turn adheres, to allow the former to be carried forward. In several we observe on the under part of the body two series of pores, the orifices of as many small internal pouches, considered by some naturalists as organs of respiration, although they are usually filled with a mucous fluid. The intestinal canal is straight, inflated from space to space for two-thirds of its length, where there are two cæca. The blood swallowed is preserved there, red and unchanged, for several weeks.

Several of them form their eggs into a cocoon, and envelop them with a fibrous excretion.

They have been subdivided from characters principally drawn from the organs of their mouth. In the

Sanguisuga, *Savigny*,

Or, the *Leech, properly so called*, the superior lip of the anterior cup or sucker is divided into several segments; the aperture is transverse and contains three jaws, each edge of which is armed with two rows of very fine teeth, which enable it to penetrate through the skin without causing a dangerous wound. It is marked with ten small points, considered as eyes.

We all know the medicinal or Common Leech—*Hirudo medicinalis*, Lin., that useful instrument for the local abstraction of blood. It is usually blackish, with yellowish streaks above, and yellowish with black spots beneath. It is found in all stagnant waters. The remaining divisions are *Hæmopsis* (The Horse Leech), *Bdella*, *Nephelis*, &c. &c.

Gordius, *Linnæus*.

The body resembling a thread, the only mark of the articulations being slight, transverse plicæ; it has neither feet, branchiæ, nor tentacula. Internally, however, a nervous system is perceptible in a knotted cord. Perhaps it will be necessary in the end to place them among the cavitary Intestina, like the Nemertes.

They live in fresh water, in the mud, and in inundated grounds which they perforate in every direction.

The different species are not yet well distinguished; the most common, *Gordius aquaticus*, Lin., is several inches in length, almost as fine as a hair, and brown, with blackish extremities.

CRUSTACEA, ARACHNIDES, AND INSECTA:

OR ARTICULATED ANIMALS WITH ARTICULATED FEET.

These last three classes of the Articulata, which were united by Linnæus under the general name of *Insecta*, are distinguished by at least six articulated feet. Each articulation is tubular, and contains the muscles of the succeeding one, which always moves by ginglymus, that is, in but one direction.

The first articulation, which attaches the foot to the body, and which is composed of two pieces, is called the *coxa*, or hip; the following one, which is, usually, nearly in a horizontal position, the *femur*, or thigh; and the third, generally vertical, the *tibia* or leg. To these ensues a

suite of small ones which touch the ground, forming the true foot, or what is denominated the *tarsus*.

The hardness of the calcareous or horny envelope of the greater number of these animals, is owing to that of the excretion which is interposed between the dermis and epidermis, or what is termed in man the *mucous tissue*. This excretion also contains the brilliant and varied colours with which they are so often decorated.

They are always furnished with eyes, which are of two kinds: simple eyes or ocelli, which resemble a very minute lens, generally three in number, and arranged in a triangle on the summit of the head; and compound eyes, where the surface is divided into an infinitude of different lenses called *facets*, to each of which there is a corresponding filament of the optic nerve. These two kinds may be either united or separated, according to the genus.

Other organs which for the first time are here presented to us, and which are found in two of these classes (the Crustacea and the Insecta), the *antennæ*, are articulated filaments, varying greatly in form, and frequently according to the sex, attached to the head, appearing to be peculiarly devoted to a delicate sense of touch, and perhaps to some other kind of sensation of which we have no idea, but which may refer to the state of the atmosphere.

These animals enjoy the sense of smell and that of hearing. Some authors place the seat of the first in the antennæ, others, in the orifices of the tracheæ, and Marcel de Serres, &c. in the palpi; neither of these opinions, however, is corroborated by positive and conclusive facts. As to the second, it is only in the Crustacea Decapoda and some few of the Orthoptera, that we can find a visible ear.

The mouth of these animals presents a great analogy, which extends to those which can only feed by the suction of liquid aliment.

Those called *Tritores* or Grinders (*brayeurs*), on account of their having jaws fitted for triturating their food, always present them in lateral pairs, placed one before the other; the anterior pair are especially called *mandibles*; the pieces which cover them before and behind are named *labia*, and the front one, in particular, *labrum*. The *palpi* are articulated filaments attached to the jaws or to the lower lip, and appear to be employed by the animal in recognising its food. The form of these various organs determines the nature of the regimen with as much precision as the teeth of quadrupeds. The *ligula*, or tongue, commonly adheres to the lower lip. Sometimes, in the Bees and other Hymenopterous Insects, it is considerably elongated, as are also the jaws, forming a sort of false proboscis (*promuscis*) at the base of which

is the pharynx, and frequently covered by a sort of sub-labrum, styled by M. Savigny the *epipharynx*. At other times, in the *Hemiptera* and *Diptera*, the mandibles and maxillæ are replaced by scaly pieces in the form of setæ, which are received in an elongated tubular sheath, that is either cylindrical and articulated, or formed with more or less of an elbow, and terminated by a kind of lips. In this case they constitute a true proboscis. In others that also live by suction, the *Lepidoptera*, the maxillæ alone are greatly elongated and united, producing a tubular setiform body, resembling a long, slender, and spiral tongue; the remaining parts of the mouth are considerably reduced. Sometimes again, as in many of the Crustacea, the anterior feet approach the maxillæ, assume their form, and exercise part of their functions—the latter are then said to be multiplied. It may even happen that the true maxillæ become so much reduced, that the maxillary feet supply their place altogether. Whatever be the modifications of these parts, however, they can always be recognised and referred to a general type.

CLASS I.

CRUSTACEA.

The Crustacea are articulated animals, with articulated feet, respiring by means of branchiæ, protected in some by the borders of a shell, and external in others, but which are not inclosed in special cavities of the body, and which receive air from openings in the surface of the skin. Their circulation is double, and analogous to that of the Mollusca. The blood is transmitted from the heart, which is placed on the back, to the different parts of the body, whence it is sent to the branchiæ, and thence back again to the heart. These branchiæ, sometimes situated at the base of the feet, or even on them, and at others on the inferior appendages of the abdomen, either form pyramids composed of laminæ in piles, or bristled with setæ, or tufted filaments of simple ones, and even appear in some cases to consist wholly of hairs.

The Crustacea are apterous or deprived of wings, furnished with compound eyes, though rarely with ocelli, and usually with four antennæ. They have mostly—the Pœcilopoda excepted—three pairs of jaws, the two superior ones, designated by the name of *mandibles*, included; as many *foot-jaws*, the last four of which, however, in a

great many instances, become true feet; and ten feet properly so called, all terminated by a single small nail. The mouth, as in Insects, presents a labrum and a ligula, but no lower lip, properly so called, or comparable to that of the latter; the third pair of foot-jaws, or the first, closes the mouth externally, and replaces that part.

Their envelope is usually solid, and more or less calcareous. They change their skin several times, and generally preserve their primitive form and natural activity. They are mostly carnivorous and aquatic, and live several years. They do not attain their adult state until after casting their skin a certain number of times. With the exception of a few in which these changes somewhat influence their primitive form and modify or augment their locomotive organs, they are at birth, size apart, such as they are always to remain.

Division of the Crustacea into Orders.

The situation and form of the branchiæ, the mode in which the head is articulated with the trunk, the mobility or fixedness of the eyes, the organs of manducation, and the teguments, constitute the basis of our divisions, and give rise to the following orders.

We divide this class into two sections, the MALACOSTRACA, and the ENTOMOSTRACA.

The first are usually furnished with very solid teguments, of a calcareous nature, and with ten to fourteen feet, generally unguiculated. The mouth, situated in the ordinary place, is composed of a labrum, tongue, two mandibles (frequently furnished with palpi), and two pairs of maxillæ covered by the foot-jaws. In a great number each eye is placed on an articulated and moveable pedicle, and the branchiæ are concealed under the lateral margins of the upper or lower shell; in the others they are usually placed under the post-abdomen. This section consists of five orders: the *Decapoda, Stomapoda, Læmodipoda, Amphipoda,* and the *Isopoda.* The four first embrace the genus CANCER of Linnæus, and the last his ONISCUS.

The second, the Entomostraca, or "Insects with shells" of Muller, is formed of the genus MONOCULUS, Lin. Here the teguments are horny and very thin, while a shell, resembling a buckler, composed of from one to two pieces, covers or incloses the body of the greater number. The eyes are almost always sessile, and frequently there is but one. The feet, the number of which varies, are mostly fitted for natation, and without a terminal nail. Some of them, having an anterior mouth, composed of a labrum, two mandibles—rarely furnished with palpi, a tongue, and one, or at most two pairs of jaws, of which the

external ones are naked or are not covered by the foot-jaws, approximate to the preceding Crustacea. In the other Entomostraca, which seem to approach the Arachnides in several particulars, the organs of manducation are sometimes simply formed by the coxæ of the feet, projecting and arranged like lobes bristling with small spines round a large central pharynx. At others they either compose a little siphon or beak, used for suction, as in several Arachnides and Insects, or they are wholly (or nearly so) invisible externally, either because the siphon is internal, or because the suction is produced in the manner of a cup.

The Entomostraca are thus dentated or edentated. The first will form our order of the BRANCHIOPODA, and the second that of the PÆCILOPODA.

FIRST GENERAL DIVISION.

MALACOSTRACA.

THE Malacostraca naturally divide themselves into those whose eyes are placed on a moveable pedicle, and those in which they are sessile and fixed.

a. EYES *placed on a moveable and articulated pedicle.*

ORDER I.

DECAPODA*.

THE head, in the Decapoda, is closely joined to the thorax, and covered with it by a shell, entirely continuous, but that most frequently exhibits deep lines dividing it into various regions which indicate the places occupied by the principal internal organs. The mode of their circulation presents characters which distinguish them from the other Crustacea.



These animals grow but slowly, and live a long time. It is among them that we find the largest and most useful species, but their flesh is not

* Ten-footed.

easily digested. The body of some Palinuri attains the length of a metre. Their claws are efficacious weapons, and have such power in large individuals, that they have been seen to seize a goat, and drag it from the shore. They usually inhabit water, but do not instantly perish when deprived of it; some species even pass a part of their lives on land. Even they are compelled to fix their domicil either in burrows, or in cool, damp places. The Decapoda are voracious and carnivorous. Certain species even penetrate into cemeteries, and devour the dead. Their limbs are regenerated with surprising promptitude, but it is requisite that the fracture be at the junction of the articulations, and yet when accident determines it otherwise, they know how to apply a remedy. When they wish to change their skin, they seek a retired and solitary spot, in order to be sheltered from their enemies, and to remain at rest. When the change is effected, their body is soft, and has a more exquisite flavour. A chemical analysis of the old shell proves it to be formed of the carbonate and phosphate of lime, united in different proportions with gelatine.

FAMILY I.

BRACHYURA*.

Tail shorter than the trunk, without appendages or fins at the extremity, and doubled under in a state of rest, when it is received in a fossula on the chest. Triangular in the males, and only furnished at base with four or two appendages in the form of horns, the superior of which are the largest, it becomes widened and convex in the females, presenting beneath four pairs of double hairy filaments, destined to support the ova, and analogous to the subcaudal natatory feet of the Macroura, and others.

This family may constitute but one genus, that of

Cancer, *Linnæus*,

Or *the Crabs*. Naturalists, however, have now divided them into the *Swimmers, Arcuated, Quadrilateral, Orbicular, Triangular*, &c., differing in shape, the number and form of the spines or teeth, the relative proportion of the eyes and their pedicles, &c. Each of these sections are again divided into numerous genera.

Among the most noted of these we find the *Land Crabs* of intertropical countries. Their habits are a constant source of interest to travellers, but by abstracting from their accounts all improbable and doubtful facts, their history will be as follows. The greater portion of their life is passed on land, where they secrete themselves in holes, from which they never issue but at

* Short-tailed.

night. Some inhabit cemeteries. Once in the year they collect in immense bands, and pursue a direct course to the sea, heedless of all obstacles; after depositing their ova, they return much enfeebled. It is said that they seal up the mouth of their burrow during the time they are casting their shell.

FAMILY II.

MACROURA*.

In the Decapoda Macroura, the end of the tail is provided with appendages which most frequently form a fin on each side; the tail itself is at least as long as the body, extended, exposed, and simply curved towards its posterior extremity. Its under surface usually presents in both sexes five pairs of false feet, each terminated by two laminæ, or as many filaments. This tail is always composed of seven distinct segments. The branchiæ are formed of vesicular, bearded and hairy pyramids, arranged in several of them, either in two rows, or in separate fasciculi. The antennæ are generally elongated and salient. The ocular pedicles are usually short. The external foot-jaws are mostly narrow and elongated, resembling palpi, and do not wholly cover the other parts of the mouth. The shell is narrower and more elongated than that of the Brachyura, and usually terminates by a point in the middle of the front.

With De Geer and Gronovius, we will arrange them in a single genus, that of

Astacus,

Which we divide in the following manner. Some, by the proportions, figure, and uses of their feet, of which the first, or at least the second pair, are in the form of claws, and by the subcaudal situations of their ova, evidently approach the preceding Crustacea, and approximate still more closely to those commonly known by the names of *Crawfish*, *Lobster*, and *Shrimp*.

The feet of the others are very slender, and are furnished with an exterior and elongated appendage or branch, which seems to double their number. They are exclusively adapted for swimming, and none of them terminate in a forceps. The ova are situated between them, and not under the tail.

This genus is now divided into four sections, each consisting of numerous subgenera. In one of these (*Pagurus*) we find the Hermit (*Cancer Bernhardus*, Lin.) which inhabits univalve shells, stopping the aperture with its

* Long-tailed.

right claw, which is the largest. It is common in European seas. In another (*Astacus*, Fab.) we find the *Astacus marinus* or Common Lobster. The fresh water species are known by the name of *Craw-fish*. Among these also we find the Shrimp (*Crangon*), and the Prawns (*Palæmon*).

ORDER II.

STOMAPODA.

The branchiæ of the Stomapoda are exposed and attached to the five pairs



of sub-abdominal appendages, exhibited to us by that part of the body, called tail, in the Decapoda, and which here, as in most of the Macroura, are fitted for swimming, or are fin-feet. Their shell is divided into two portions, the anterior of which supports the eyes and intermediate antennæ, or composes the head without giving origin to the foot-jaws. These organs, as well as the four anterior feet, are frequently approximated to the mouth on two lines that converge inferiorly, and hence the denomination of Stomapoda affixed to this order.

The teguments of the Stomapoda are thin, and in several nearly membranous or transparent. The shell is sometimes formed of two shields, of which the anterior corresponds to the head and the posterior to the thorax, and sometimes of a single piece, which however is free behind, usually exposing the thoracic segments bearing the three last pairs of feet, and having an articulation before that serves as a base to the eyes and intermediate antennæ; these latter organs are always extended and terminated by two or three threads. The eyes are always approximated. The formation of the mouth is essentially the same as in the Decapoda; but the palpi of the mandibles, instead of being laid on them, are always vertical. The foot-jaws are deprived of the flagelliform appendage presented to us by the same parts in the Decapoda. They have the form of claws or of small feet, and, at least in several—the Squillæ,—their external base as well as that of the two anterior feet, properly so called, exhibits a vesicular body.

The Stomapoda are all marine Crustacea. Their favourite habitat is in the intertropical latitudes, and they are not found beyond the temperate zones. Of their habits we are totally ignorant; that those which are furnished with claws use them in seizing their prey, in the manner of those Orthoptera called *Mantes*, we cannot doubt. Hence their vulgar appellation of *Sea-Mantis:* they are the *Crangones* and *Crangines* of the Greeks. According to Risso they prefer sandy bottoms in deep water. Other Stomapoda, those of our second family, being less favoured with natatory appendages, and having a much flatter and more superficially extended body, are generally found on the surface of the water, where they move very slowly. We will divide the Stomapoda into two families.

FAMILY I.

UNIPELTATA.

In this family the shell consists of a *single shield*, of an elongated quadrilateral form, usually widened and free behind, covering the head, the antennæ and eyes excepted, which are placed on a common anterior articulation, and at least the first segments of the body. Its anterior extremity terminates in a point, or is preceded by a small plate with a similar end. All the foot-jaws, the second of which are very large, and the four anterior feet, are closely approximated to the mouth on two inferiorly converging lines, and have the form of claws, with a single finger or mobile and flexed hook. With the exception of the second feet all these organs are furnished at their external origin with a little pediculated vesicle. The other six feet, at the base of whose third segment is a lateral appendage, are linear, terminated by a brush, and simply natatory. The lateral antennæ have a scale at their base, and the stem of the intermediaries is composed of three filaments. The body is narrow and elongated; the ocular pedicles are always short.

This family is composed of but one genus, that of

Squilla, *Fabricius.*

Which is now divided into the *True Squillæ, Gonodactylus, Coronis,* &c.

FAMILY II.

BIPELTATA.

In this family we find the shell divided into two shields, the anterior of which, very large and more or less oval, forms the head, and the posterior, corresponding to the thorax, transverse and angular in its circumference, supports the foot-jaws and feet. These latter, with the exception at most of the two posterior and two last foot-jaws, are slender and filiform, usually very long, and accompanied by a lateral ciliated appendage. The other four foot-jaws are very small and conical. The base of the lateral antennæ exhibits no scale; the intermediaries are terminated by two threads. The ocular pedicles are long. The body is much flattened, membranous, and diaphanous; the abdomen small and its posterior fin without spines. It comprises but a single genus, the

Phyllosoma, *Leach,*

Of which all the species inhabit the Atlantic Ocean and Oriental seas.

MALACOSTRACA.

b. Eyes sessile and immoveable.

The Branchiopoda are the only Crustacea of which we shall henceforward have occasion to speak, that exhibit eyes placed on pedicles. But independently of the fact that these pedicles are neither articulated nor lodged in special cavities, the Branchiopoda have no shell, and are otherwise removed from the preceding Crustacea by various characters. All the Malacostraca of this division are also deprived of a shell; their body, from the head downwards, is composed of a suite of articulations, of which each of the first seven is furnished with a pair of feet, the following and last ones, seven at most, forming a sort of tail terminated by fins or styliform appendages. The head presents four antennæ, the two intermediate superior, two eyes, and a mouth composed of two mandibles, a tongue, two pairs of jaws, and a sort of lip formed by two foot-jaws that correspond to the two superior ones of the Decapoda; here, as in the Stomapoda, the flagrum no longer exists. The four last foot-jaws are transformed into feet, sometimes simple and at others constituting a claw, but almost always with a single toe or hook.

All these Crustacea are small, and mostly inhabit the sea-coast or fresh water. Some are terrestrial, and others are known which are parasitical.

ORDER III.

AMPHIPODA.

The Amphipoda are the only Malacostraca with sessile and immoveable eyes,



whose mandibles, like those of the preceding Crustacea, are furnished with a palpus, and the only ones whose subcaudal appendages, always very apparent, by their narrow and elongated form, their articulations, bifurcations, and other incisures, as well as by the hairs or cilia with which they are provided, resemble false or natatory feet. In the Malacostraca of the following orders, these appendages have the form of laminæ or scales; here these hairs and cilia appear to constitute the branchiæ. Many of them, like the Stomapoda and the Læmodipoda, have vesicular bursæ either between their feet or at their external base, the use of which is unknown.

The first pair of feet, or that which corresponds to the second foot-jaws, is always annexed to a particular segment, the first after the head. The antennæ, which, with a single exception—the Phronimæ,—are four in number, project, gradually taper into a point, and consist, as in the preceding Crustacea, of a peduncle and a single stem, or one furnished at most with a little lateral branch, and usually composed of several joints. The body is generally com-

pressed and curved beneath posteriorly. The terminal appendages of the tail are most frequently styliform and articulated. Most of them swim and leap with facility and always laterally. Some inhabit springs and rivulets; most of them however live in salt water. Their colour is uniform, verging on reddish or greenish.

They may all be comprised in a single genus, that of

GAMMARUS, *Fabricius.*

Which is now divided into various subgenera, such as *Phronima*, *Hyperia*, &c. Among the most interesting of these is the

COROPHIUM, *Latreille.*

The *C. longicornis*, called *Pernys*, on the coast of Rochelle, lives in holes, which it forms in the mud, that is covered with hurdles, called *bouchots* by the inhabitants. The animal does not make its appearance till the beginning of May. It wages everlasting war against the Nereides, Amphinomæ, Arenicolæ, and other marine Annulata, which inhabit the same locality. A curious spectacle is presented by these Crustacea when the tide is coming in; myriads of them may then be seen moving in every direction, beating the mud with their great arms, and diluting it in order to discover their prey: is it one of the above mentioned Annulata they have discovered, which is ten or twenty times larger than themselves? they unite to attack and devour it. The carnage never ceases until the mud has been thoroughly turned up and its inequalities levelled. They do not even spare Mollusca, Fishes, or dead bodies on the shore. They mount upon the hurdles which contain Muscles, and fishermen assert that they will cut the threads that keep them there, in order to precipitate them into the mud, where they may devour them at their leisure.

ORDER IV.

LÆMODIPODA.*

THE Læmodipoda are the only Malacostraca with sessile eyes, in which the posterior extremity of the body exhibits no distinct branchiæ, and which are almost deprived of a tail, the two last feet being inserted in that extremity, or the segment which connects them with it being merely followed by one or two very small joints. They are also the only ones in which the two anterior feet, that correspond to the second foot-jaws, form part of the head.



They all have four setaceous antennæ supported by a triarticulated peduncle, mandibles without palpi, a vesicular body at the base

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* Throat-footed.

of at least the four pairs of feet, beginning at the second or third pair, those of the head included. The body, usually filiform or linear, is composed of eight or nine segments, including the head and some small appendages in the form of tubercles at its posterior and inferior extremity. The feet are terminated by a stout hook. The four anterior, the second of which are the largest, are always terminated by a monodactyle forceps or a claw. In several, the four following ones are shortened, less articulated, without the terminal hook, or are rudimental, and nowise adapted for the ordinary uses of similar parts.

The females carry their ova under the second and third segments of the body, in a pouch formed of approximated scales. They are all marine Crustacea.

We may unite them in a single genus which, by the law of priority, should be called

CYAMUS, *Latreille.*

Now divided into *Leptomera*, *Naupredia*, *Caprella*, and *Cyamus proper*.

ORDER V.

ISOPODA*.

THE Isopoda approach the Læmodipoda by the absence of the palpi of the mandibles, but are removed from them in several other respects. The two anterior feet are not attached to the head, and belong, as well as the following ones, to a particular segment. They are always fourteen in number, unguiculated, and without any vesicular appendage at their base. The under part of the tail is furnished with very apparent appendages resembling leaflets or vesicular bursæ, the two first or external of which, either partially or wholly, usually cover the others. The body is generally flattened, or is wider than it is thick. The mouth consists of the same pieces as in the preceding Crustacea; but here, those which correspond to the two superior foot-jaws of the Decapoda, exhibit an appearance of a lower lip, terminated by two palpi, still more than in the latter. The two mediate antennæ are almost obliterated in the last Crustacea of this order, which are all terrestrial, and also differ from the others in their respiratory apparatus. Most of them are aquatic. Those which are terrestrial, like all other Crustacea which live out of water, still require a certain degree of atmospheric humidity to enable them to breathe, and to preserve their branchiæ in a proper state for the exercise of that function.



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* Equal-footed.

This order, according to the system of Linnæus, embraces the genus

ONISCUS, *Linnæus*,

Which is now divided into six sections. Those of the first are parasitical. The subgenera are numerous. Some are aquatic and others terrestrial. Among the latter we have the

ONISCUS, *Linnæus*.

The true Onisci have eight joints in their lateral antennæ, but their base is covered, and the two external appendages of the extremity of the tail are much larger than the others. These animals are vulgarly called *Clous-à-porte*, and by syncope *Cloporte*, *Porcelets de Saint-Antoine*, *Wood lice*, &c. They inhabit retired and obscure places, cellars, fissures in walls, old buildings, under stones, &c. &c. They feed on decaying vegetable and animal matters, and seldom issue from their retreat, except in rainy weather. They move but slowly, unless they are alarmed. The ova are inclosed in a pectoral pouch. The young, at birth, have one thoracic segment less than the adult, and consequently have but twelve feet.

SECOND GENERAL DIVISION.

ENTOMOSTRACA.

UNDER this denomination, which is taken from the Greek, and signifies *Insects with shells*, Othon Frederick Muller comprises the genus *Monoculus* of Linnæus, to which we must add some of his Lerneæ.

These animals, mostly microscopic, are all aquatic, and mostly inhabit fresh water. Their feet, the number of which varies, and that sometimes extends to beyond a hundred, are usually fitted for natation only, being sometimes ramified or divided, and sometimes furnished with pinnulæ or formed of lamellæ. Their brain is formed of one or two globules. The heart has always the figure of a long vessel. The branchiæ, composed of hairs or setæ, single or united, in the form of barbs, combs, or tufts, constitute part of those feet or of a certain number of them, and sometimes of the upper mandibles. Hence the origin of our term Branchiopoda, affixed to these animals, of which at first we formed but a single order. Nearly all of them are provided with a shell composed of one or two pieces, very thin, and most generally almost membranous and nearly diaphanous, or at least with a large anterior thoracic segment, frequently confounded with the head, which appears to replace the shell. The teguments are usually rather horny than calcareous, thereby approximating these animals to the Insecta and Arachnides.

ORDER I.

BRANCHIOPODA*.

A MOUTH composed of a labrum, two mandibles, a ligula, and one or two pairs of jaws, and branchiæ, the first of which, when there are several, are always anterior, charactertise this order or the sixth of the class.



These Crustacea are always errant, and are generally protected by a shell resembling that of a bivalve, and furnished with four or two antennæ. Their feet, with a few exceptions, are wholly natatory. Their number varies, being but six in some, while in others it amounts to twenty, forty-two, or more than a hundred. Many of them have but one eye.

Most of these animals, as we have already stated, being nearly microscopal, it is evident that the application of one of the characters we have employed—that of the presence or absence of the palpi of the mandibles—with respect to them, presents almost insuperable difficulties. The form and number of the feet, that of the eyes, the shell, the antennæ, furnish us with more visible marks, and such as are within the observation of every one.

This order, in the systems of De Geer, Fabricius, and Linnæus, a single species excepted,—*M. Polyphemus*,—contained but the single genus

MONOCULUS, *Linnæus*,

Which is now divided into two great sections and various subgenera.

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* Gill-footed.

ORDER II.

PÆCILOPODA*.



The Pæcilopoda are distinguished from the Branchiopoda by the diversity in the form of their feet, among the anterior of which an indeterminate number are ambulatory, or fitted for prehension ; while the others, lamelliform or pinnate, are branchial and natatory. It is principally, however, by the absence of the usual mandibles and jaws that they are removed from all other Crustacea. Sometimes these parts are replaced by the spinous haunches of the first six pairs of feet ; and sometimes the organs of manducation consist either of an external siphon in the form of an inarticulated rostrum, or of some other apparatus fitted for suction, but concealed or slightly apparent.

Their body is almost always, either wholly or for the greater portion, invested with a shell in the form of a shield, consisting of a single plate in most of them, and of two in others, which always presents two eyes when those organs are distinct. Two of their antennæ—*Cheliceræ*, Lat.—form a forceps in several, and fulfil its functions. Most of them have twelve feet, and nearly all the remainder have either ten or twenty-two. Their usual habitat is on aquatic animals, and most commonly on fishes.

We divide this order into two families.

FAMILY I.

XYPHOSURA.

This family is distinguished from the second by several characters: there is no siphon ; the haunches of the first six pair of feet are covered with small spines, and perform the office of jaws; there are twenty-two feet ; the first ten, with the exception of the two anterior ones in the males, are terminated by a didactyle forceps, and inserted, as well as the two that follow, under a large semilunar shield. They are wandering animals, and form the genus

Limulus, *Fabricius.*

The species are known in commerce by the name of the Molucca Crab.

These animals are sometimes found two feet in length, they inhabit the seas of hot climates, and most generally frequent their shores. They appear to

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* Various-footed.

me to be proper to the East Indies and the coast of America. The species found in France—*L. cyclops*—is commonly called the *Casserole* *, from its having some resemblance to the form of that utensil, and because when the feet are removed its shell is used to hold water. Savages employ the stylet of the tail to point their arrows, which, thus armed, are much dreaded. Their eggs are eaten in China. When these animals walk, their feet are not seen. Fossil specimens are found in certain strata of a moderate antiquity.

FAMILY II.

SIPHONOSTOMA.

The Siphonostomæ have no kind of jaws whatever. A *sucker or siphon*, sometimes external and in the form of an acute inarticulated rostrum, and at others concealed or but slightly visible, fulfils the *functions of a mouth*. There are never more than fourteen feet. The shell is very thin, and composed of a single piece. They are all parasitical.

This family is now divided into two tribes, the Calagides, comprising *Argula* and *Caligus* (or the Fish-Louse), and the Lerneiformes, which consists of two genera also. They are *Dichelestium* and

Nicothoe.

These animals terminate the Crustacea, and are distinguished from all others of that class by their heteroclitical form. To the naked eye they seem nothing more than two lobes united in the form of a horse-shoe, which encloses two others. By the aid of glasses, however, we discover that the two large lobes are formed by the great expansion of the sides of the thorax, which resemble wings, are almost oval, and thrown behind; that the two others are clusters of eggs, &c.

Nicothoe astaci, Aud. and Edw. The only species known; it is about half a line long and three lines broad, the thoracic enlargement included. It is rose-coloured, paler on the oviferous sacs; the expansions yellowish. It adheres closely to the branchiæ of the Lobster, and penetrates deeply between the filaments of those organs.

TRILOBITES.

According to Brongniart and various other naturalists, it is in the vicinity of the Limuli and other Entomostraca with numerous feet,

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* The *King-crab* of our fishermen, or the *Horse-shoe*. Very common on the coast of New Jersey.

that we should place these singular fossil animals, originally confounded under the common name of *Entomolithus paradoxus,* and now designated by that of Trilobites. By this hypothesis we have to admit as a positive, or at least highly probable fact, the existence of locomotive organs, although, notwithstanding the most careful investigation, no vestige of them has been discovered. Presuming, on the contrary, that these animals were deprived of them, I thought that their natural position was in the neighbourhood of the Chitones, or rather that they constituted the original stock of the Articulata, being connected on the one hand with these latter Mollusca, and on the other, with those first mentioned, and even with the Glomeres, to which some Trilobites, such as the Calymenes, appear to approximate, as well as to the Chitones, inasmuch as by contracting they could also become spherical. Be this as it may, these animals appear to have been annihilated by some ancient revolution of our planet.

The Trilobites, one heteromorphous genus excepted, that of Agnostus, have, like the Limuli, a large anterior segment in the form of an almost semicircular or lunated shield, followed by from about twelve to twenty-two segments, all transversal except the last, and divided by two longitudinal sulci into three ranges of parts or lobes, whence their name of Trilobites. Some naturalists call them *Entomostracites.*

They are divided by M. Brongniart into the following genera: *Agnostus, Calymene, Asaphus, Ogygia* and *Paradoxides.*

CLASS II.

ARACHNIDES.

The Arachnides, which compose the second class of articulated animals provided with moveable feet, are, as well as the Crustacea, deprived of wings, are not subject to changes of form, or do not experience any metamorphosis, simply casting their skin; but they differ from them as well as from insects in several particulars. Like the latter, the surface of their body presents apertures or transverse fissures called *stigmata,* for the introduction of air, but they are few in number—eight at most, and usually but two—and confined to the inferior portion of the abdomen. Respiration is also effected either by means of air-branchiæ, fulfilling the functions of lungs that are contained in sacs, of which these stigmata are the apertures, or by radiated

tracheæ. The visual organs merely consist of ocelli, or simple eyes, which, when numerous, are variously grouped. The head, usually confounded with the thorax, in place of the antennæ, has two articulated pieces in the form of small didactyle or monodactyle chelæ, improperly compared to the mandibles of Insects, and so denominated, moving in a contrary direction to the former, or from above downwards, still however co-operating in the business of manducation, and replaced in the Arachnides, where the mouth has the form of a siphon or sucker, by two pointed blades which act as lancets. A kind of lip, or rather ligula, produced by a pectoral prolongation; two jaws formed by the radical joint of the first segment of two small legs or palpi, or by an appendage or lobe of that same joint; a part concealed under the mandibles, composed of a projection in the form of a rostrum, produced by the union of a very small clypeus terminated by an extremely small triangular labrum, and of an inferior longitudinal carina, usually very hairy, are the parts which, with the pieces termed mandibles, constitute with some modifications the mouth of most of the Arachnides. The legs, like those of Insects, are commonly terminated by two hooks, and even sometimes by one more, and are all annexed to the thorax, or rather cephalo-thorax, which, except in a small number, is only formed of a single segment, and is frequently intimately united to the abdomen. This latter part of the body is soft, or but slightly defended, in most of them.

Most of the Arachnides feed on Insects which they either seize alive, or to which they adhere, abstracting their fluids by suction. Others are parasitical, and live on vertebrated animals. Some of them however are only found in flour, on cheese, and even on various vegetables. Those which live on other animals frequently multiply there to a great extent. Two of the legs, in some species, are only developed by a change of the tegument.

Division of the Arachnides into Orders.

Some have pulmonary sacs, a heart with very distinct vessels, and six or eight simple eyes. They compose our first order, or that of the PULMONARIÆ.

The others respire by tracheæ, and have no organs of circulation, or if they have, the circulation is not complete. The tracheæ are divided near their origin into various branches, and do not, as in Insects, form two trunks which run parallel to each other throughout the whole length of the body and receive air from various points by means of numerous stigmata. Here, but two, at most, are distinctly visible,

and they are situated near the base of the abdomen. The number of ocelli is at most but four. They constitute our second and last order, or that of the TRACHEARIÆ.

ORDER I.

PULMONARIÆ.



WE here find a well marked circulating system and pulmonary sacs, always placed under the abdomen, announced externally by transverse openings or fissures (stigmata), of which there are sometimes eight, four on each side, and at others four, or even two. The number of ocelli is from six to eight, while in the following order it never exceeds four, and is most generally but two; sometimes they are hardly perceptible, or even annihilated. The organ of respiration is formed of little laminæ. The heart is a large vessel which extends along the back, and gives off branches on each side and anteriorly. There are always eight legs. The head is always confounded with the thorax, and presents at its anterior superior extremity two mandibles—so called by authors, the *cheliceræ* of Latreille, terminated by two fingers, one of which is moveable, or by a single one resembling a hook or claw that is always moveable. The mouth is composed of a labrum, of two palpi, sometimes resembling arms or claws, of the two or four jaws, formed, when there are but two, by the radical joint of these palpi, and moreover, where there are four, by the same joint of the first pair of feet, and of a ligula consisting of one or two pieces.

FAMILY I.

ARANEIDES.

THIS family is composed of the genus ARANEA, Lin., or the *Spiders*. They have palpi resembling little feet, without a forceps at the end, terminated at most by a little hook. Their frontal cheliceræ (the mandibles of authors) are terminated by a moveable hook, flexed inferiorly, underneath which, and near its extremity, which is always pointed, is a little opening, that allows a passage to a venomous fluid contained in a gland of the preceding joint. There are never more than two jaws. The thorax usually marked with a depression in the form of a V, indicating the space occupied by the head, consists of a single segment, posteriorly to which, by means of a short pedicle, is suspended a

moveable and usually soft abdomen; it is always furnished with from four to six closely approximated cylindrical or conical, articulated mamillæ with fleshy extremities, which are perforated with numberless small orifices for the passage of silky filaments of extreme tenuity proceeding from internal reservoirs. Their legs, identical as to form, but of different sizes, are composed of seven joints, of which the two first form the hip, the third the thigh, the fourth and fifth the tibia, and the two others the tarsus: the last is terminated by two hooks usually pectinated, and in several by one more, which is smaller and not dentated. The intestinal canal is straight, consisting of a first stomach, composed of several sacs, and then of a second stomach or dilatation surrounded with silk.

The nervous system is composed of a double cord occupying the median line of the body, and of ganglions which distribute nerves to the various organs.

With respect to the simple eyes, or ocelli, M. Dufour remarks that they shine in darkness like those of cats, and that the Araneides most probably enjoy the faculty both of nocturnal and diurnal vision.

The abdomen becomes so putrid and decomposed after death, that its colours and even its form are soon destroyed. M. Dufour, by means of a rapid desiccation, the mode of which he points out, has succeeded in remedying this evil to a great degree.

The silk, according to Réaumur, is first elaborated in two little reservoirs, shaped like tears of glass, placed obliquely, one on each side, at the base of six other reservoirs, resembling intestines, situated close to each other, flexed six or seven times, proceeding from a little beneath the origin of the abdomen, and terminating in the papillæ by a very slender thread. It is in these last mentioned vessels that the silk acquires a greater degree of firmness and other properties peculiar to it; they communicate with the preceding ones by branches, forming a number of geniculate turns, and then various pieces of net-work. The newly spun filaments, when first drawn from the mamillæ, are adhesive, and a certain degree of desiccation or evaporation is required to fit them for their destined purposes. When the temperature is propitious, however, a single instant is sufficient, as the animal employs them the moment they escape from the apparatus. Those white and silky flocculi that may be observed floating about in spring and autumn in foggy weather, are certainly produced—as we satisfactorily ascertained by tracing them to their point of origin—by various young Araneides; they are mostly the larger threads which are intended to afford points of attachment to the radii of the web, or those that compose the chain, and which, becoming more ponderous by the access of moisture, sink, approach one another, and finally form little pellets: we frequently observe them collected near the web commenced by the spider, and in which it resides.

It is also very probable that many of the young animals, not having as yet a sufficient supply of silk, limit their structure to throwing out simple threads. It is, I think, to the young Lycosæ that we must attribute those which intersect the furrows of ploughed grounds, whose numbers are rendered so apparent

by the reflection of light after sunrise. By chemical analysis, these threads exhibit the same characters as the web of the spider: they are not then formed in the atmosphere, as, for want of proper observation, *ex visu*, that celebrated naturalist, M. Lamarck, has conjectured. Gloves and stockings have been made with this silk; but it was found impossible to apply the process on a large scale, and as it is subject to many difficulties, is rather a matter of curiosity than utility. This substance, however, is of much greater importance to the little animal in question. With it, the sedentary species, or those which do not roam abroad in search of their prey, weave webs of a more or less compact tissue, whose form and position vary according to the peculiar habits of each of them, and that are so many snares or traps, where the insects on which they feed become entangled, or are taken. No sooner is one of them arrested there by the hooks of its tarsi, than the Spider, sometimes placed in the centre of his net, or at the bottom of his web, or at others lying in ambush in a peculiar domicil situated near and in one of the angles, rushes towards his victim and endeavours to pierce him with his murderous dart, distilling into the wound a prompt and mortal poison; should the former resist too vigorously, or should it be dangerous to the latter to approach it, he retreats, waiting until it has either exhausted its powers by struggling, or become more entangled in the net; but should there be no cause of fear, he hastens to bind it by involving the body in his silken threads, with which it is sometimes completely enveloped.

Lister says that Spiders dart their threads in the same way that the Porcupine darts his quills, with this difference, however, that in the latter, according to the popular belief, the spines are detached from the body, whereas in the former, these threads, though propelled to a considerable distance, always remain connected with it. The possibility of this has been denied. Be it as it may, we have seen threads issuing from the mamillæ of several Thomisi form straight lines, and when the animals moved circularly, producing moveable radii. A second use to which this silk is applied by all female Araneides, is in the construction of the sacs destined to contain their eggs. The texture and form of these sacs are variously modified, according to the habits of the race. They are usually spheroidal; some of them resemble a cap or tymbal, others are placed on a pedicle, and some are claviform. They are sometimes partially enveloped with foreign bodies, such as earth, leaves, &c.; a finer material, or sort of tow or down, frequently surrounds the eggs in their interior, where they are free or agglutinated and more or less numerous.

I have ascertained that a single wound from a moderate sized spider will kill our common Fly in a few minutes. It is also certain that the bite of those large ones of South America, which are there called Crab-Spiders, and are placed by us in the genus Mygale, kills the smaller vertebrated animals, such as Humming-Birds, Pigeons, &c., and produces a violent fever in Man; the sting of some species in the south of France has even occasionally proved fatal. We may, therefore, without believing all the fabulous stories of Baglivi and others respecting the bite of the Tarantula, mistrust Spiders, and particularly the larger ones.

Various insects of the genus Sphex, Lin., (Wasps,) seize upon them, pierce them with their sting, and transport them into holes where they have deposited their eggs, as a source of food for their young. Most of them perish in winter, but there are some which live several years—such are the Mygales, the Lycosæ, and probably several others.

M. Leon Dufour, who has published many excellent memoirs on the anatomy of Insects, who has especially studied those of Valencia, among which he has detected several new species, and to whose labours the science of botany is not less indebted, has paid particular attention to the respiratory organs of Spiders, and it is from him that we have taken our divisions, which consist of those that have four pulmonary sacs—with as many external stigmata, two on each side, and closely approximated—and of such as have but two. The first, according to our method, form but the single genus

Mygale.

Their eyes always situated at the anterior extremity of the thorax, and usually closely approximated; feet and cheliceræ robust. Most of them have but four fusi*, of which the two lateral or external, situated somewhat above the others, are longest, and consist of three segments, exclusive of the prominence that forms their peduncle. They weave silken tubes in which they reside, and which they conceal either in holes excavated by them for that purpose, or under stones, bark of trees, or between leaves.

This genus now forms several divisions, characterised by the number of fusi, the relative difference in the length of the legs and the situations of the palpi. in the

Mygale, *Walckenaer*,

Or the *true Mygales*, the hairs which decorate the under part of their tarsi form a thick and broad brush, projecting beyond the hooks, and usually concealing them.

This division is composed of the largest species of the family, some of which, when at rest, cover a circular space of from six to seven inches in diameter. They sometimes seize upon Humming-Birds. They establish their domicil in the clefts of trees, under the bark, in the fissures of rocks, or on the surface of leaves of various plants. The cell of the *Mygale avicularia* has the form of a tube, narrowed into a point at its posterior extremity. It consists of a white web, of a close, very fine texture, semi-diaphanous, and resembling muslin.

South America and the Antilles produce other species, called by the French colonists *Araignèes-crabes*, or Crab-Spiders. Their bite is reputed to be dangerous. A very large species—*M. fasciata*—is also found in the East Indies. A species, nearly as large as the avicularia, inhabits the Cape of Good Hope.

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* *Filières*, i. e. the papillæ or fusi through which the thread passes.

In the following Mygales, the superior extremity of the first joint of the cheliceræ presents a series of spines, articulated and moveable at base, and forming a sort of rake. The tarsi are less pilose underneath than in the preceding division, and their hooks are always exposed.

These species, in the dry and mountain districts of the south of Europe and of some other countries, excavate subterraneous galleries, which are frequently two feet in depth, and so extremely tortuous, that, according to Dufour, it is frequently impossible to trace them. At the mouth, they construct a moveable operculum with earth and silk, fixed by a hinge, which, from its form, nicely adjusted to the aperture, its inclination, its weight, and the superior position of the hinge, spontaneously shuts, and completely closes the entrance of their habitation, forming a kind of trap-door, which is scarcely distinguishable from the surrounding earth. Its inner surface is lined with a layer of silk, to which the animal clings, in order to keep its door shut and prevent intruders from opening it. If it be slightly raised, it is a sure indication that the owner is within. Unearthed, by laying open the gallery front of the entrance, it becomes stupified, and allows itself to be captured without resistance. A silken tube, or the nest properly so called, lines the inside of the gallery. There are several species.

The remaining subgenera are *Atypus*, *Eriodon*, &c., differing in the insertion of the palpi, the ligula, number of eyes, &c.

We now pass to Araneides with but one pair of pulmonary sacs, and as many stigmata. They all have palpi formed of five joints, inserted into the external side of the jaws near their base, and most frequently in a sinus; a ligula extending between them either nearly square, triangular, or semi-circular, and six fusi at the extremity.

With the exception of a few species, which enter into the genus Mygale, they compose that of

Aranea, *Linnæus.*

A first division will comprehend the Araneæ Sedentariæ, or Sedentary Spiders. They make webs, or throw out threads to ensnare their prey, and always remain in these traps, or their vicinity, as well as near their eggs. Their eyes are approximated anteriorly and are sometimes eight in number, of which four or two are in the middle, and two or three on each side, and sometimes six.

Some, which, from the circumstance of their always moving forwards, we term the Rectigradæ, weave webs and are stationary; their legs are elevated when at rest; sometimes the two first and two last are the longest, and at others those of the two anterior pairs, or the fourth and the third. The general arrangement of the eyes does not form the segment of a circle or a crescent.,

They may be divided into three sections: the first, or that of the Tubitelæ, has cylindrical fusi approximated into a fasciculus directed backwards; the legs are robust, the two first or the two last, and vice versa, longest in some, and the whole eight nearly equal in others.

CLOTHO, *Walckenaer.*

A singular subgenus. The cheliceræ are very small, can separate but little, and are not indented; very small hooks; the shortness of the body and length of the legs produce a resemblance to the Crab-Spiders or Thomisi. The relative length of these organs differs but little; the fourth pair, and then the preceding one are merely somewhat longer than the first; the tarsi, only, are furnished with spines. The eyes are further from the anterior margin of the thorax than in the following subgenus, and are approximated and arranged as in the genus Mygale of Walckenaer; three on each side form a reversed triangle; the two others form a transverse line in the space comprised between the two triangles. The jaws and the ligula are proportionably smaller than those of the same subgenus; a short projection or slight dilatation on the external side of the jaws, gives insertion to the palpi; the jaws terminate in a point; the ligula is triangular and not nearly oval as in Drassus. The two superior or most lateral fusi are long, but what, according to Dufour, particularly characterises the Clothos, is, that there are two pectiniform valves which open and shut at the will of the animal, in place of the two intermediate fusi.

But a single species is known, the *Clotho Durandii*, Lat. M. Dufour found it in the mountains of Narbonne, in the Pyrenees and among the rocks of Catalonia. To this latter naturalist we are indebted not only for our knowledge of the external characters of this spider, but for many curious observations relative to its habits. "She constructs," says he, "a shell resembling a calotte, an inch in diameter, on the under surface of large stones or in the fissures of rocks. Its contour presents seven or eight emarginations, the angles of which are alone attached to the stone by silken fasciculi, the margin being free. This singular tent is admirably woven. The exterior resembles the very finest taffeta, formed, according to the age of the animal, of a greater or less number of layers. Thus, when the young Uroctea first commences her establishment, she merely forms two webs between which she seeks for shelter. Subsequently, and I believe at each change of tegument, she adds a certain number of layers. Finally, she lines an apartment with a softer and more downy material, which is to enclose the sac of eggs and young ones. Although the exterior shell is more or less soiled by foreign bodies, which serve to conceal it, the chamber of the industrious architect is always extremely neat and clean. There are four, five, or six egg-pouches or sacculi in each domicil; they are lenticular, more than four lines in diameter, and formed of a snow-white taffeta lined with the softest down. The ova are not produced till the latter end of December or the beginning of January; the young are to be protected from the rigour of winter and the incursions of enemies—all is prepared; the receptacle of this precious deposit is separated from the web that adheres to the stone by soft down, and from the external calotte by the various layers I have mentioned. Some of the emarginations in the edge of the pavilion are completely closed by the continuity of the web, the edges of the remainder are merely laid on each other, so that by raising them up, the animal can issue from its tent or enter it at pleasure. When the Uroctea leaves her habitation for the chase, she has

nothing to fear; she only possesses the secret of the impenetrable emargination, and has the key to those which alone afford an entrance. When her offspring are able to provide for themselves, they leave their native dwelling, to establish elsewhere their individual habitations, while the mother returns to it and dies—it is thus her cradle and her tomb."

There are several other genera of this section, such as *Drassus*, *Segestria*, *Clubona*, &c., in the last of which, as well as in the following ones, we find eight eyes. They form two families, the Terrestrial and Aquatic. Some (Clubiona) construct silken tubes under stones; and others (Aranea proper), a web with a tube, in our houses, along hedges, &c.

In the second section of the sedentary and rectigrade spiders, that of the Inequitelæ, the external papillæ are nearly conical, project but little, are convergent, and form a rosette; the legs are very slender. The jaws incline over the lip, and become narrower at their superior extremity, or at least do not sensibly widen.

Most of them have the first pair of legs longest, and then the fourth. The abdomen is more voluminous, softer, and more coloured than in the preceding tribes. Their webs form an irregular net composed of threads which cross each other in every direction and on several planes. They lie in wait for their prey, display much anxiety for the preservation of their eggs, and never abandon them till they are hatched. They are short-lived.

There are several genera, such as *Scytodes*, *Theridion*, *Episinus*, &c. differing in the number of eyes, and the mode of their arrangement; the shape of the thorax, &c.

In the third section of the sedentary rectigrade spiders, the Orbitelæ, the external fusi are almost conical, slightly salient, convergent, and form a rosette; the legs are slender, as in the preceding section, but the jaws are straight, and evidently wider at their extremity.

The first pair of legs, and then the second, are always the longest. There are eight eyes thus arranged; four in the middle forming a quadrilateral, and two on each side.

The Orbitelæ approach the Inequitelæ in the size, softness, and diversity of colour of the abdomen, and in their short term of existence; but their web is a regular piece of net-work, composed of concentric circles intercepted by straight radii diverging from the centre, where they almost always remain, and in an inverted position, at the circumference. Some conceal themselves in a cell or cavity which they have constructed near the margin of the web, which is sometimes horizontal, and at others perpendicular. Their eggs are agglutinated, very numerous, and inclosed in a voluminous cocoon.

The threads which support the web, and which can be extended one-fifth of their length, are used for the divisions of the micrometer.

Linyphia, *Latreille.*

The Linyphiæ are well characterised by the disposition of their eyes: four in the middle form a trapezium, the posterior side of which is widest, and is occupied by two eyes much larger and more distant; the remaining four are

grouped in pairs, one on each side, and in an oblique line. The jaws are only widened at their superior extremity.

They construct on bushes a loose, thin, horizontal web, attaching to its upper surface, at different points, or irregularly, separate threads. The animal remains at its inferior portion, and in a reversed position.

ULOBORUS, *Latreille.*

The four posterior eyes placed at equal intervals on a straight line, and the two lateral ones of the first line nearer to the anterior edge of the thorax than the two comprised between them, so that this line is arcuated posteriorly. The tarsi of the three last pairs of legs terminate by one small nail. The first joint of the two posterior ones has a range of small setæ.

The body of these animals, as well as in the following subgenus, is elongated and nearly cylindrical. Placed in the centre of their web, they advance their four anterior legs in a straight line, and extends the two last in an opposite direction; those of the third pair project laterally.

These Arachnides construct webs similar to those of other Orbitelæ, but they are looser and more horizontal. They will completely envelope the body of a small coleopterous insect in less than three minutes.

TETRAGNATHA, *Latreille.*

The eyes placed four by four on two nearly parallel lines, and separated by almost equal intervals; jaws long, narrow, and only widened at their superior extremity. The cheliceræ are also very long, in the males especially. The web is vertical.

EPEIRA, *Walckenaer.*

The two eyes on each side approximated by pairs, and almost contiguous; the remaining four forming a quadrilateral in the middle. The jaws dilate from their base, and form a rounded palette.

The *cucurbitina* is the only species known whose web is horizontal; that of the others is vertical, or sometimes oblique.

Some place themselves in its centre in a reversed position, or with their head downwards; others construct a domicil close by it, either vaulted on all sides, or forming a silky tube composed of leaves drawn together by threads, or open above, and resembling a cup or the nest of a bird. The web of some exotic species is formed of such stout materials that it will arrest small Birds, and even impede the progress of a Man.

Their cocoon is usually globular; that of some species, however, is a truncated oval, or very short cone.

The natives of New Holland and those of some of the South Sea Islands, for want of other food, eat a species of Epeira, closely allied to the *Aranea esuriens*, Fabricius. They are numerous.

We now come to Spiders that are sedentary, like the preceding, but which have the faculty of moving sideways, forwards and backwards, in a word, in all directions. They constitute our section of the LATERIGRADÆ. The four

anterior legs are always longer than the others; sometimes the second pair surpasses the first, and at others, they are nearly equal; the animal extends them to the whole of their length on the plane of position.

The cheliceræ are usually small, and their hook is folded transversely, as in the four preceding tribes. Their eyes, always eight in number, are frequently very unequal, and form a segment of a circle or crescent; the two posterior lateral ones are placed farther back than the others, or are nearer to the lateral margin of the thorax. The jaws, in most of them, are inclined on the lip. The body is usually flattened, resembling a Crab; the abdomen is large, rounded, and triangular.

These Arachnides remain motionless on plants, with their feet extended. They make no web, simply throwing out a few solitary threads to arrest their prey. Their cocoon is orbicular and flattened. They conceal it between leaves, and watch it until the young ones are hatched.

The Laterigradæ form several genera, such as *Micrommata, Senelops,* &c.

Other Araneæ whose eyes, always eight in number, extend more along the length of the thorax than across its breadth, or at least almost as much in one direction as the other, and which form either a truncated curvilinear triangle or oval, or a quadrilateral, constitute a second general division, or the VAGABUNDÆ, which I have thus named to distinguish them from those of the first, or the Sedentariæ.

Two or four of their eyes are frequently much larger than the others; the thorax is large and the legs robust; those of the fourth pair and then the two first, or those of the second pair, are usually the longest.

They make no web, but watch for their prey and seize it, either by hunting it down, or by suddenly leaping upon it.

This division forms two sections, each consisting of several genera. In the first, or that of the CITIGRADÆ, we find the genus

LYCOSA, *Latreille.*

The eyes of the Lycosæ form a quadrilateral, but one as long as or longer than it is wide; the two posterior eyes are not placed on an elevation. The first pair of legs is evidently longer than the second, but shorter than the fourth, which, in this respect, surpasses all the others. The internal extremity of the jaws is obliquely truncated. The ligula is square but longer than it is broad.

Almost all the Lycosæ keep on the ground, where they run with great swiftness. They inhabit holes accidentally presented to them, or which they excavate, lining their parietes with silk, and enlarging them in proportion to their growth. Some establish their domicil in chinks and cavities in walls, where they form a silken tube covered externally with particles of earth or sand. In these retreats they change their tegument, and as it appears, after closing the opening, pass the winter. There also the females lay their eggs. When they go abroad they carry their cocoon with them, attached to the abdomen by threads. On issuing from the egg the young

ones cling to the body of the mother, and remain there until they are able to provide for themselves.

The Lycosæ are extremely voracious, and courageously defend their dwelling.

A species of this genus, the *Tarentula*, so called from Tarentum, a city of Italy, in the environs of which it is common, is highly celebrated. The poisonous nature of its bite is thought to produce the most serious consequences, being frequently followed by death or *Tarentism*, results which can only be avoided by the aid of music and dancing. Well informed persons, however, think it more necessary in these cases to combat the terrors of the imagination than to apply an antidote to the poison; medicine at all events presents other means of cure.

In the second section of the Vagabundæ, that of the SALTIGRADÆ, the eyes form a large quadrilateral, the anterior side of which, or the line formed by the first ones, extends across the whole width of the thorax; this part of the body is almost square or semi-ovoid, plane or but slightly convex above, as wide anteriorly as in the rest of its extent, and descending suddenly on the sides. The legs are fitted for running and leaping. The thighs of the two fore legs are remarkable for their size.

The *Araignée à chevrons blancs* of Geoffroy, a species of Salticus very common in summer on walls or windows exposed to the sun, moves by jerks, stops short after a few steps and raises itself on its fore legs. If it discover a fly, or particularly a musquito, it approaches softly, and then darts upon the victim with a single bound. It leaps fearlessly and perpendicularly on a wall, being always attached to it by a thread, which lengthens as it advances. This same filament also supports it in the air, enables it to ascend to its point of departure, and allows it to be wafted by the wind from one place to another. Such, generally, are the habits of the species that belong to this division.

Several construct nests of silk resembling oval sacs open at both ends, between leaves, under stones, &c. Thither they retire to change their tegument and to seek shelter in bad weather. If danger menaces them there, they leave it at once and escape with speed.

The females construct a sort of tent, which becomes the cradle of their posterity, and in which the young ones, for a time, live in common with the mother. There are several subgenera.

FAMILY II.

PEDIPALPI.

IN the second family of the Pulmonariæ, we find very large palpi, resembling projecting arms, terminated by a forceps or a claw; didactyle cheliceræ, one finger of which is moveable, and an abdomen composed of very distinct segments, without fusi at the extremity. The whole body is invested with a firm tegument; the thorax consists of a single piece, and exhibits three

or two simple eyes, approximated or grouped, near the anterior angles; and near the middle of its anterior extremity, or posteriorly, but in the median line, two others equally simple and approximated. There are four or eight pulmonary sacs. Those which form the genus

Tarantula, *Fabricius*,

Have their abdomen attached to their thorax by a pedicle, or portion of their transverse diameter; it has no pectinated laminæ at its base, nor sting at its extremity. Their stigmata, four in number, are situated near the origin of the venter, and are covered with a plate. Their cheliceræ (mandibles) are simply terminated by a moveable hook. Their ligula is elongated, very narrow, and concealed. They have but two jaws, which are formed by the first joint of their palpi.

They all have eight eyes, of which three, on each side and near the anterior angles, form a triangle; and two near the middle at the anterior margin are placed on a common tubercle or little elevation, one on each side. The palpi are spinous. The tarsi of the two anterior legs differ from the others, being formed of numerous setaceous or filiform joints, and without a terminal nail.

They are confined to the hottest portions of Asia and America. Their habits are unknown to us. They now constitute two subgenera, Phrynus, Olivier and Thelyphonus, Latreille.

The others have their abdomen intimately united to the thorax throughout its entire width, presenting, at its inferior base, two moveable pectiniform laminæ, and terminated by a knotted tail armed with a terminal sting. Their stigmata, eight in number, are exposed, and arranged four by four along the abdomen: their cheliceræ are terminated by two fingers, of which the exterior is moveable. They form the genus

Scorpio, *Linnæus, Fabricius.*

Scorpions have an elongated body, suddenly terminated by a long slender tail formed of six joints, the last of which terminates in an arcuated and excessively acute point or sting, which affords issue to a venomous fluid contained in an internal reservoir, forming a long square, and usually marked in the middle by a longitudinal sulcus, presenting on each side, and near its anterior extremity, three or two simple eyes, forming a curved line, and near the middle of the back two others, also simple, which are approximated. The palpi are very large, with a forceps at the extremity resembling a hand; their first joint forms a concave and rounded jaw.

These Arachnides inhabit the hot countries of both hemispheres, live on the ground, conceal themselves under stones and other bodies, most commonly in ruins, dark and cool places, and even in houses. They run with considerable swiftness, curving their tail over their back. They can turn it in every direction, and use it for the purposes of attack and defence. With their forceps they seize Onisci and various insects, Carabici, Orthopteræ, &c., on which they feed, pierce them with their sting by directing it forwards, and then pass their

prey through their cheliceræ and jaws. They are particularly fond of the eggs of Spiders and of Insects.

The wound occasioned by the sting of the *europæus* is not usually dangerous. That of the Scorpion of Souvignargues, of Maupertuis, of the species which I have named Roussatre (*occitanus*), and which is larger than the preceding one, according to the experiments of Dr. Maccary courageously tried upon himself, produces serious and alarming symptoms; the older the animal the more active seems to be the poison. The remedy employed is the volatile alkali, used externally and internally. There are several species.

ORDER II.

TRACHEARIÆ.

The Arachnides which compose this order differ from those of the preceding one in their organs of respiration, which consist of radiated or ramified tracheæ*, that only receive air through two stigmata, in the absence of an organ of circulation; and in the number of their eyes, which is but from two to four. The want of sufficiently general anatomical observations, has prevented the limits of this order from being rigorously determined. Some of these Arachnides, the Pycnogonides for instance, exhibit no stigmata; their mode of respiration is unknown.



The Trachearіæ are very naturally divided into those which are furnished with cheliceræ, terminated by two fingers, one of which is moveable, or by one that is equally so; and into those where these organs are replaced by simple laminæ, or lancets, which with the ligula constitute a sucker. Most of these animals, however, being very small, great difficulties necessarily accompany these investigations, and it is readily perceived that such characters should only be resorted to when it is impossible to avoid it.

FAMILY I.

PSEUDO-SCORPIONES.

In this family we find the thorax articulated, its first segment much the largest, and resembling a corselet; the abdomen is very distinct and annulated, and the palpi very large and in the form of legs or claws. There are eight legs, with two equal hooks at the extremity of the tarsi, the two anterior ones,

* The tracheæ are vessels which receive the aerial fluid and distribute it to every part of the interior of the body, and thus remedy the want of circulation.

at most, excepted, and two apparent cheliceræ terminated by two fingers and two toes, formed by the first joint of the palpi. They are all terrestrial, and have an oval or oblong body. This family comprehends but two genera.

GALEODES, *Olivier*.—SOLPUGA, *Lichtenstein, Fabricius*.

Two very large cheliceræ, with strongly dentated vertical fingers, one superior, fixed, and frequently furnished at its base with a slender, elongated, pointed appendage, and the other moveable; large projecting palpi in the form of feet or antennæ, terminated by a short, vesicular joint, resembling a button without a terminal hook; the two anterior feet of an almost similar figure, equally unarmed, but smaller.

Their body is oblong, generally soft, and bristled with long hairs. The last joint of the palpi, according to M. Dufour, contains a particular organ formed like a disk, of a nacre-white, and which never protrudes unless the animal is irritated. The two anterior feet may be considered as second palpi. The abdomen is oval, and composed of nine annuli.

It is supposed that the ancients designated these animals by the names of *Phalangium, Solifuga, Tetragnatha*, &c. M. Poë discovered a species in the environs of Havana, but the others are peculiar to the hot and sandy countries of the eastern continent. They run with great celerity, erect their heads when surprised, and show signs of resistance; they are considered venomous.

CHELIFER, *Geoffroy*.—OBISIUM, *Illiger*.

The palpi elongated in the form of an arm, with a hand terminated by a didactyle forceps; all the legs equal, terminated by two hooks; the eyes placed on the sides of the thorax.

These animals resemble small Scorpions destitute of a tail. Their body is flattened, and the thorax nearly square, with one or two eyes on each side.

They run swiftly, and frequently retrograde or move sideways like Crabs.

FAMILY II.

PYCNOGONIDES.

THE trunk, in this family, is composed of four segments, occupying nearly the whole length of the body and terminated at each extremity by a tubular joint, the anterior of which is the largest, sometimes simple, and sometimes accompanied by cheliceræ and palpi, or only one kind of these organs, that constitutes the mouth. There are eight legs in both sexes, formed for running, but the female is furnished with two additional false ones, placed near the two anterior, and solely destined to carry her eggs.

The Pycnogonides are marine animals, analogous either to the Cyami and the Caprellæ, or to the Arachnides of the genus Phalangium, where Linnæus placed them. Their body is commonly linear, with very long legs, composed of eight or nine joints, terminated by two unequal hooks, which appear to form

but one, and the smallest of which is cleft. The first segment of the body, which replaces the head and mouth, forms a projecting tube, cylindrical or in the form of a truncated cone, with a triangular aperture at its extremity. The cheliceræ and palpi are placed at its base. The former are cylindrical or linear, simply prehensile, and composed of two joints, the last of which is a forceps, the inferior finger or the one that is fixed being sometimes shorter than the other. The palpi are filiform, and consist of five or nine joints, with a terminal hook. Each of the following segments, the last excepted, bears a pair of legs; but the first, or the one articulated with the mouth has a tubercle on the back, on which are placed two eyes on each side, and beneath, in the females only, two additional small folded legs, bearing the eggs which are collected around them in one or two pellets. The last segment is small, cylindrical and perforated by a little orifice at the extremity. No vestige of stigmata can be perceived.

They are found among marine plants, sometimes under stones near the beach, and occasionally also on the Cetacea.

Pycnogonum, *Muller, Fabricius.*

The cheliceræ and palpi wanting; length of the feet hardly greater than that of the body, which is proportionably thicker and shorter than in the following genera. They live on the Cetacea.

Phoxichilus, *Latreille.*

The palpi wanting, as in the Phoxichili; but the legs are very long, and there are two cheliceræ.

Nymphon, *Fabricius.*

The Nymphones resemble the Phoxichili in the narrow and oblong form of their body, the length of their legs, and in the presence of cheliceræ; but they have, besides, two palpi.

FAMILY III.

HOLETRA.

The trunk and abdomen are here united in one mass, under a common epidermis, or at most, the thorax is divided by a strangulation, and the abdomen, in some, merely exhibits an appearance of annuli, formed by the plicæ of the abdomen.

The anterior extremity of their body frequently projects in the form of a snout or rostrum; most of them have eight legs, and the remainder six.

This family consists of two tribes. In the first or the Phalangita, Lat., we observe very apparent cheliceræ, which either project in front of the trunk, or are inferior, and always terminating in a didactyle forceps, preceded by one or two joints.

They have two filiform palpi, composed of five joints, the last of which is terminated by a small nail; two distinct eyes; two jaws formed by the prolongation of the radical joint of the palpi, and frequently four more, which are also a mere dilatation of the hip of the two first pairs of legs. The body is oval or rounded, and covered, the trunk at least, with a firmer skin; there is also an appearance of annuli or plicæ on the abdomen. The legs, of which there are always eight, are long, and distinctly divided, like those of Insects. At the origin of the two posterior legs, at least in several—Phalangium—are two stigmata, one on each side, but hidden by their hips.

Most of them live on the ground, at the foot of trees, and on plants, and are very active; others conceal themselves under stones and in moss.

Phalangium, *Linnæus, Fabricius.*

The cheliceræ projecting, much shorter than the body; eyes placed on a common tubercle. Their legs are very long and slender, and when detached from the body show signs of irritability for a few moments.

There are some other genera, viz., *Siro*, *Macrocheles* and *Trogulus*.

In the second tribe of the Holetra, that of the Acarides, we sometimes find cheliceræ, but they are simply formed of a single forceps, either didactyle or monodactyle, and are hidden in a sternal lip; sometimes there is a sucker formed of united lancets; or finally the mouth consists of a simple cavity without any apparent appendages. This tribe is composed of the genus

Acarus, *Linnæus.*

Most of these animals are very small or nearly microscopical. They are observed everywhere. Some of them are errant, and of these some are found under stones, leaves, bark of trees, in the earth, in water, dried meat, old cheese, and putrescent animal matters. Others are parasitical, living on the skin or in the flesh of various animals, which they often, by their excessive multiplication, reduce to a state of great debility. The origin of certain diseases, such as the itch, is attributed to particular species. The experiments of Dr. Galet prove that if the Acari of the human psora be placed on the body of a perfectly healthy person, they will inoculate him with the virus of that disorder. Various species of Acari are also found on Insects, and some of the Coleoptera that feed on cadaverous substances are frequently covered with them. They have even been observed in the brain and eye of Man.

The Acari, or *Mites*, as they are vulgarly termed, are oviparous, and excessively prolific. Several of them at first have but six legs, the remaining two being developed shortly after. Their tarsi terminate in various ways, according to their habits.

Some—Acarides, Lat.—or the Acari proper, have eight legs, solely destined for walking, and cheliceræ.

Trombidium, *Fabricius.*

The cheliceræ monodactyle, or terminated by a moveable hook; salient palpi,

pointed at the end, with a moveable appendage or species of finger under their extremity, two eyes, each placed on a little immoveable pedicle. The body is divided into two parts, the first of which, or the anterior, is very small, and bears the two first pair of legs, together with the eyes and mouth.

Tromb. holosericeum, Fab. Very common in gardens in the spring; blood-red; abdomen nearly square, posteriorly narrowed, with an emargination; the back loaded with papillæ, hairy at base, and globular at the extremity.

There are various other subgenera, such as Erythræus, Gamasus, Cheyletus, Oribata, Uropoda, &c.

Here we find our *Common Ticks*. The most remarkable is that of the subgenus,

Ixodes, *Latreille*, *Fabricius*.

The palpi forming a sheath to the sucker, and with it constituting a projecting and short rostrum, truncated and slightly dilated at the extremity.

The Ixodes are found in thick woods abounding in brushes, briars, &c., they hook themselves to low plants by the hind legs, keeping the others extended, and fasten on Dogs, Oxen, Horses, and other Quadrupeds, and even on the Tortoise, burying their suckers so completely in their flesh, that they can only be detached by force, and by tearing out the portion that adheres to it. These insects lay a prodigious quantity of eggs, and sometimes increase to such an enormous extent on the Ox and Horse, that they perish from the exhaustion. Their tarsi are terminated by two hooks inserted in a palette, or united at the base on a common pedicle.

The ancients designated these Arachnides by the term *Ricinus*. They are our *Ticks*.

CLASS III.

INSECTA.

Insects, which form the third class of articulated animals provided with articulated legs, have, besides, a dorsal vessel analogous to the vestige of a heart, but totally destitute of any branch for the circulation. They respire by means of two principal tracheæ, extending, parallel to each other, throughout the whole length of the body, having centres, at intervals, from which proceed numerous branches, corresponding to external openings or stigmata, which admit air. They all have two antennæ and a distinct head. The nervous system of most Insects—the Hexapoda—is generally composed of a brain formed of two opposing ganglions, united at base, giving off eight pairs of nerves and two single ones, and of twelve ganglions, all inferior. By

counting the eight pairs of the brain, and the ten spinal bridles, which may also be considered as so many pairs of nerves, we shall have in all forty-five pairs, exclusive of two solitary nerves, or from twelve to fourteen more than are found in the human subject. In our general remarks on points common to the three classes of articulated animals provided with articulated feet, we mentioned the various opinions of physiologists with respect to the seat of the sense of hearing and of smell. We will merely add, in regard to the former, that certain little nervous frontal ganglions seem to confirm the opinion of those who, like Scarpa, place it in the origin of the antennæ. I have detected two small orifices near the eyes of certain Lepidoptera, which, perhaps, are auditory canals. If, in several Insects, particularly those furnished with filiform, or long, setaceous antennæ, they (the antennæ) are organs of touch, it seems to us difficult to account for the extraordinary development they acquire in certain families, and more particularly in the males, if we refuse to admit that they are then the seat of smell. The palpi also, in some cases, as when they are greatly dilated at the extremity, may possibly be the principal organs of smell, part of which sense may also perhaps belong to the ligula.

The digestive system consists of a preparatory or buccal apparatus, intestinal canal, biliary vessels, also called *hepatic vessels*, those styled *salivary*, but which are less general, free and floating vessels, the epiploon or *corps graisseux*, and probably of the dorsal vessel. This system is singularly modified, according to the difference of the aliment, or it forms a great number of particular types, of which we shall speak when treating of families. We will merely say a word with respect to the buccal apparatus and the principal divisions of the intestinal canal, beginning with the latter. In those where it is the most complicated, as in the carnivorous Coleoptera, we observe a pharynx, œsophagus, crop, gizzard, stomach, or chylific ventricle, and intestines.

Some few, and always apterous Insects, such as the Myriapoda, approximate to several of the Crustacea, either in the number of the annuli of their body and in their legs, or in some points of analogy in the conformation of the parts of the mouth; but all the others never have more than six legs, and their body, the number of whose segments never extend beyond twelve, is always divided into three principal parts, the *head*, *trunk* and *abdomen*. Among the latter Insects, some are found without wings, that always preserve their natal form, and merely increase in size and change their skin. In this respect they bear some analogy

to the animals of the preceding classes. Nearly all the remaining Hexapoda have wings; but these organs, and even frequently the feet, do not make their appearance at first, but are only developed after a series of changes, more or less remarkable, styled *metamorphoses*, of which we shall soon have to speak.

The head bears the *antennæ*, *eyes*, and *mouth*. The composition and form of the antennæ are much more various than in the Crustacea, and are frequently more developed or longer in the males than in the females.

The eyes are either compound or simple; the first, according to the baron Cuvier, Marcel de Serres and others, are formed: 1, of a cornea, divided into numerous little facets, which is so much the more convex, as the insect is more carnivorous; its internal surface is covered with an opaque, and variously coloured, but slightly fluid substance, usually, however, of a black or deep violet hue; 2, of a choroides, fixed by its contour and edges to the cornea, covered with a black varnish, exhibiting numerous air vessels, arising from tolerably large trunks of tracheæ in the head, whose branches form a circular trachea round the eye: it is frequently wanting, however, as well as the choroides, in various nocturnal insects; 3, of nerves arising from a large trunk, proceeding directly from the brain, which then opens, forming a reversed cone, the base of which is next to the eye, and each of whose rays or threads traversing the choroides and lining matter of the cornea, terminates in one of its facets; there is no crystalline nor vitreous humour.

Several, besides these compound eyes, have simple ones, or *ocelli*, the cornea of which is smooth. They are usually three in number, and are disposed in a triangle on the top of the head. In most of the Aptera and in the larvæ of those that are winged, they replace the former, and are frequently united in a group; those of the Arachnides seem to indicate that they are fitted for the purpose of vision.

The mouth of the hexapodous insects is generally composed of six principal parts, four of which are lateral, are disposed in pairs, and move transversely; the other two, opposed to each other in a contrary direction, occupy the space comprised between the former: one is placed above the superior pair, and the other beneath the inferior. In the triturating insects (broyeurs), or those which feed on solid matters, the four lateral parts perform the office of jaws, the other two being considered as lips; but, as we have already observed, the two superior jaws have been distinguished by the peculiar appellation of *mandibles*, the others alone bearing that of maxillæ or *jaws*; the latter are also furnished with one or two articulated filaments called *palpi*, a character

never exhibited, in this class, by the mandibles. Their extremity is often terminated by two divisions or lobes, the exterior of which, in the Orthoptera, is called the *galea*. We have already said that the upper lip was called the *labrum*. The other, or the *labium* properly so styled, is formed of two parts; the one, inferior and solid, is the *mentum* or chin; the other, which is usually provided with two palpi, is the *ligula*.

In the *Suctoria*, or those that live by the suction of fluid aliment, these various organs of manducation present themselves under two kinds of general modifications. In the first, the mandibles and the jaws are replaced by little laminæ in the form of setæ or lancets, forming, by their union, a sort of sucker, which is received into a sheath, supplying the place of a labium, and is either cylindrical or conical, and articulated in the form of a *rostrum*, or fleshy or membranous, inarticulated, and terminated by two lips constituting a *proboscis*. The labrum is triangular and arched, and covers the base of the sucker.

In the second modification, the labrum and mandibles are nearly obliterated, or are extremely small: the labium is no longer free, and is only distinguishable by the presence of two palpi, to which it gives insertion: the jaws have acquired a most extraordinary length, and are transformed into tubular filaments, which, being united at their edges, compose a sort of spiral proboscis called the *tongue*, but which, to avoid all equivocation, it would be better to call *spirignatha;* its interior exhibits three canals, the intermediate of which is the duct of the alimentary juices. At the base of each of these filaments is a palpus, usually very small, and but slightly apparent.

The Myriapoda are the only insects in which the mouth presents another mode of organisation—it will be explained in treating of that order.

The trunk of insects, or that intermediate portion of their body which bears the legs, is generally designated by the term *thorax*, or *corselet* by the French. It is composed of three segments, not well distinguished at first, the relative proportions of which vary considerably. Sometimes, as in the Coleoptera, the anterior, much the largest, separated from the following one by an articulation, moveable, and alone exposed, appears at the first glance to constitute the entire trunk, and is called the *thorax* or *corselet;* sometimes, as in the Hymenoptera, Lepidoptera, &c., it is much shorter than the ensuing one, has the appearance of a collar, and, with the two others, forms a common body, attached to the abdomen by a pedicle, or adhering closely to it across its whole posterior width, and is also called *thorax*. These distinctions

were insufficient, and Mr. Kirby having already employed the denomination of *metathorax*, to designate the after-thorax, that of *prothorax* and *mesothorax*, the ternary division once established, naturally presented itself to the mind, and the celebrated professor Nitzsch was the first to employ it. Some naturalists have since designated the prothorax or anterior segment, that which bears the two first feet, by the term collar, *collare*. Wishing to retain the denomination of *corselet*, but to restrain its application within proper limits, we will employ that term in all those cases where this segment is much larger than the others, and where these latter are joined to the abdomen, and seem to constitute an integral part of it—a disposition proper to the Coleoptera, Orthoptera, and several of the Hemiptera. When the prothorax is short, and forms with the succeeding segments a common and exposed mass, the trunk composed of the three will retain the name of thorax. We will also continue to style *pectus* the inferior surface of the trunk, dividing it according to the segments, into three areæ, the *ante-pectus*, *medio-pectus*, and *post-pectus*. The median line will also constitute the sternum, which we divide into three parts: the *ante-sternum*, *medio-sternum*, and *post-sternum*.

The teguments of the thoracic segments, as well as those of the abdomen, are usually divided into two annuli or semi-annuli, the one dorsal or superior, the other inferior, laterally united by a soft and flexible membrane, which, however, is but a portion of the same tegument that in many Insects, the Coleoptera particularly, is less firm. At the point of junction between these annuli we observe a little space of a more solid texture, or of the consistence of the annulus itself, which bears stigmata, so that the sides of the abdomen present a longitudinal series of small pieces, or each segment seems to be quadripartite. Other equally corneous pieces occupy the inferior sides of the mesothorax and metathorax and immediately under the origin of the elytra and wings, which are supported by another longitudinal piece. The relations of these parts, the size and form of the first joint of the coxæ, the manner in which they are articulated with the semi-annulus to which they belong, the extent and direction of that semi-annulus varying, furnish the thorax, thus considered, with a combination of characters, which in a systematic point of view are of great importance.

As Insects inhabit all kinds of dwellings, they are provided with all sorts of locomotive organs, *wings* and *feet*, which, in several, act as *fins*.

The wings are membranous, dry, elastic organs, usually diaphanous, and attached to the sides of the back of the thorax: the first, when there

are four, or when they are unique, on those of its second segment, and the second on those of the following or of the metathorax. They are composed of two membranes laid one on the other, and are traversed in various directions by more or less numerous nervures, which are so many tracheal tubes, now forming a net-work, and then simple veins. The Libellulæ, Apes, Vespæ, Papiliones, &c., have four wings; but those of the latter are covered with small scales, which at the first glance resemble dust, and give them the magnificent colours in which they are dressed. They are easily removed with the finger, and that portion of the wing becomes transparent. By the aid of glasses we discover that these scales are of various figures, and implanted in the wing by means of a pedicle, arranged gradually and in series, like tiles on a roof. Before the superior wings of these Insects are two species of epaulettes—*pterygoda*—which extend posteriorly along a portion of the back on which they are laid. The wings of some Insects remain straight, or are doubled transversely. Those of others are folded or plaited longitudinally like a fan. Sometimes they are horizontal, and sometimes inclined in the manner of a roof; in several they cross on the back, and in others they are distant. Directly under them, in the Diptera, are two small moveable threads with a claviform termination, which, according to the general opinion, seem to replace the two wings that are wanting. They are called *halteres*. Other two-winged and more extraordinary Insects have also two halteres, but situated at the anterior extremity of the thorax, which to distinguish from the others we will call *prohalteres*. Above these appendages is a little membranous scale formed of two pieces united by one of their edges and resembling a bivalve shell—it is the *alula* or *cueilleron*. The same appendage is also observed under the elytra (at their base) of some aquatic Coleoptera.

Many Insects, such as the Melolonthæ, Cantharides, &c. in lieu of the two superior or anterior wings, are furnished with two species of scales, more or less solid and opaque, which open and close, and beneath which, when at rest, the wings are transversely folded. These scales or *wing cases* are called *elytra*. The Insects provided with them are named *Coleoptera*, and in such they are never absent, though this is sometimes the case with respect to the wings. In other Insects the extremity of the scale is completely membranous, or like the wing: they are styled *Hemiptera*.

The *scutel* or *scutellum* is usually a small triangular piece, situated on the back of the mesothorax, and between the insertions of the elytra or of the wings. Sometimes it is very large, and then it covers the

greater part of the superior portion of the abdomen. In various Hymenoptera, behind the scutellum and on the metathorax, we find a little space called the *post-scutellium.*

The ambulatory organs of locomotion consist of a *coxa* formed of two pieces, a *femur*, an unarticulated *tibia*, and of a *tarsus*, which is divided into several phalanges. The number of its articulations varies from three to five, a difference which greatly depends upon the proportional changes experienced by the first and penultimate joints. Although their supputation may sometimes prove embarrassing, and this numerical series may not always be in exact accordance with the natural order, it furnishes a good character for the distinction of genera. The last joint is usually terminated by two hooks. The form of the tarsi is subject to some modifications, according to the habits of the animal. Those of aquatic species are usually strongly ciliated and flattened, and resemble oars.

The abdomen, which forms the third and last part of the body, is confounded, in the Myriapoda, with the thorax: but in all other Insects, or those which have but six feet, it is distinct. It contains the viscera, &c., presenting nine or ten segments or annuli, some of which, however, are frequently concealed or considerably reduced. The last annuli of the abdomen, in several females, form a retractile or always projecting ovipositor more or less complicated, which acts like an auger. A sting is substituted for it in many of the female Hymenoptera. The female lays her eggs, and deposits them in the way best adapted for their preservation, and in such a manner that the moment the larvæ make their appearance, suitable aliment is always within their reach. Frequently she collects provisions for them. This maternal solicitude often excites our surprise, and more particularly unveils the instinct of Insects. In the numerous societies of several of these animals, such as the Ant, Termes, Wasp, Bee, &c., those individuals which form the greater portion of the community, and by whose labour and vigilance the whole community are maintained, have been considered as being of neither sex. They have also been designated by the terms of *labourers* and *mules*. It is now known, however, that they are females not fully developed.

The ova are sometimes hatched in the abdomen of the mother; she is then *viviparous*. The number of generations in a year depends on the duration of each of them. Most commonly there is but one or two.

A female Papilio, or Butterfly, lays her eggs, from which are hatched, not Butterflies, but animals with an elongated body, divided into rings, and a head furnished with jaws and several small eyes, having very

short feet, six of which are anterior, scaly, and pointed, the rest varying in number and membranous, being attached to the posterior annuli. These animals, called *Caterpillars,* live in this state for a certain period, and repeatedly change their skin. An epoch, however, arrives, when from this skin of a caterpillar issues a totally different being, of an oblong form and without distinct limbs, which soon ceases to move, and remains a long time apparently desiccated and dead under the name of a *chrysalis.* By close examination we may discover on the external surface of this chrysalis, lineaments which represent all the parts of the Butterfly, but under proportions differing from those they are one day to possess. After a longer or shorter period, the skin of the *chrysalis* splits, and the Butterfly, humid and soft, with flabby short wings, issues from it—a few moments, however, and it is dry, the wings enlarge and become firm, and the perfect animal is ready for flight. It has six long legs, antennæ, a spiral proboscis, and compound eyes—in a word, it has no resemblance whatever to the caterpillar, from which it has originated, for it is ascertained that these various changes are nothing more than the successive development of parts contained one within the other.

This is what is styled the *metamorphosis* of Insects. In their first condition they are called *larvæ,* in their second *pupæ, nymphs* or *chrysalides,* and in the third *perfect insects.*

All Insects do not pass through these three states. Those which are apterous, issue from the ovum with the form they are always to preserve: they are said to be *without a metamorphosis.* Of those that have wings, many experience no other change than that of receiving them: these are said to undergo a *semi-metamorphosis.* Their larva resembles the perfect insect, with the single exception of the wings, which are totally wanting. The *nymph* only differs from the larva in possessing stumps or rudiments of wings, which are developed at its final change of tegument, and render the animal perfect. Such are the Cimices, Grylli, &c. Finally, the remaining Insects provided with wings that are said to undergo a *complete metamorphosis,* are at first *larvæ,* resembling Caterpillars or Worms, and then become motionless *nymphs,* but presenting in that state all the parts of the perfect insect contracted, and as if wrapped in a bandage.

In the nymph of the Coleoptera, Neuroptera, Hymenoptera, &c., these parts, though closely approximated and in contact with the body, are free; but they are not so in that of the Lepidoptera and of many Diptera. An elastic or solid skin is moulded over the body and its external parts, forming a kind of case for it.

That of the chrysalides of the Lepidoptera merely consisting of a simple pellicle applied to the external organs, following their contour in every direction, and forming, for each of them, so many moulds, like the envelope of a mummy, allows us to recognise and distinguish them; but those of Flies and Syrphi, formed of the dried skin of the larva, resemble an egg-like shell. It is a species of capsule or case in which the animal is shut up.

Many larvæ, before they pass into their pupa state, prepare a cocoon in which they enclose themselves, either with silk which they draw from the interior of their bodies by means of the spinning apparatus of their lip, or other materials which they collect. The perfect Insect issues from the nymph through a fissure or slit which opens on the back of the thorax. In the pupæ of Flies one of the extremities is detached, like a cap, to allow the egress of the animal.

The larvæ and pupæ of those Insects which experience a semi-metamorphosis only differ from the same in a perfect state, in the absence of wings. The other external organs are precisely alike. But in such as undergo a complete metamorphosis, the form of the body of the larva has no constant relation with that it is to possess in its perfect state. It is usually more elongated; the head is frequently very different, as well in its consistence as in its figure, having mere rudiments of antennæ or perhaps none at all; there are never any compound eyes.

There is also a great disparity in the organs of manducation, as may be easily seen by comparing the mouth of a Caterpillar with that of the Butterfly, or the mouth of the larva of a Fly with that of the perfect Insect.

Several of these larvæ are destitute of feet; others, such as the Caterpillars, have many, all, the six first excepted, membranous, and without terminal hooks. Some Insects, such as the Ephemeræ, exhibit a singular anomaly in their metamorphosis—the animal arrived at its perfect state undergoes another change of tegument.

The Insects which constitute our three first orders preserve for life their natal form. The Myriapoda, however, exhibit a kind of metamorphosis. At first they have but six legs, or, according to Savi, are altogether destitute of them; the others, as well as the segments on which they depend, are developed by age.

But few vegetable substances are protected from the voracity of Insects; and as those which are necessary or useful to man are not spared by them more than others, they become very injurious, particularly during seasons which favour their multiplication. Their destruc-

tion greatly depends upon our vigilance and knowledge of their habits. Some of them are omnivorous—such are the Termites, Ants, &c., whose ravages are but too well known. Several of those which are carnivorous, and all the species which feed on dead animal matters, &c., are a benefit conferred on us by the Author of Nature, and somewhat compensate for the inconvenience and injury we experience from the others. Some are employed in medicine, the arts, and our domestic economy.

They have numerous enemies: Fishes destroy many of the aquatic species; Birds, Bats, Lizards, &c., deliver us from a part of those which inhabit the air or earth. Most of them endeavour to escape by flight or running from the dangers that surround them, but some have recourse to stratagem or arms.

Having undergone their ultimate transformation, and being possessed of all their faculties, they continue their species:—this aim once accomplished, they soon cease to exist. Thus, each of the three finer seasons of the year produces species peculiar to it. The females and males of those which live in societies, however, enjoy a longer term of life. Individuals hatched in autumn shelter themselves from the rigours of winter, and reappear in spring.

The species, like those of plants, are circumscribed within geographical limits. Those of the western continent for instance, a very few, and all from the North, excepted, are strictly peculiar to it; such also is the case with several genera. The eastern continent, in turn, possesses others which are unknown in the western. The Insects of the south of Europe and north of Africa, and of the western and southern countries of Asia, have a strong mutual resemblance. The same may be said of those which inhabit the Moluccas, and more eastern islands, those of the Southern Ocean included. Several northern species are found in the mountains of southern countries. Those of Africa differ greatly from the opposite portions of America. The Insects of Southern Asia, from the Indies on the Sind eastward, to the confines of China, are very much alike. The intertropical regions, covered with immense and well watered forests, are the richest in Insects of any on the globe; Brazil and Guiana are particularly so.

All general systems or methods relative to Insects are reduced essentially to three. Swammerdam based his on their metamorphoses; that of Linnæus was founded on the presence or absence of wings, their number, consistence, superposition, the nature of their surface, and on the deficiency or presence of a sting. Fabricius had recourse to the

parts of the mouth alone. In all these arrangements the Crustacea and Arachnides are placed among the Insects, and in that of Linnæus, the one generally adopted, they are even the last.

I divide this class into twelve orders: the three first of which are composed of apterous Insects, undergoing no essential change of form or habits, merely subject to simple changes of tegument, or to a kind of a metamorphosis, which increases the number of legs, and that of the annuli of the body. The organ of sight in these animals is usually a mere assemblage, more or less considerable, of ocelli resembling granules.

Certain English naturalists have formed new orders, based upon the wings; I see no necessity, however, for admitting them, that of the *Strepsiptera* excepted, the name of which appears to me to be erroneous *, and which I will call *Rhipiptera* †.

In the first order of the MYRIAPODA, there are more than six feet—twenty-four and upwards—arranged along the whole length of the body, on a suite of annuli, each of which bears one or two pairs, and of which the first, and in several instances even the second, seem to form a part of the mouth. They are apterous ‡.

In the second or the THYSANOURA, there are six legs, and the abdomen is furnished on its sides with moveable parts, in the form of false feet, or terminated by appendages fitted for leaping.

In the third or the PARASITA, we find six legs, no wings, and no other organs of sight than ocelli; the mouth, in a great measure, is internal, and consists of a snout containing a retractile sucker, or in a slit between two lips, with two hooked mandibles.

In the fourth or the SUCTORIA, there are six legs, but no wings; the mouth is composed of a sucker inclosed in a cylindrical sheath, formed of two articulated portions.

In the fifth or the COLEOPTERA, there are six legs, and four wings, the two superior of which have the form of cases, and mandibles and maxillæ for mastication: the inferior wings are simply folded crosswise, and the cases, always horizontal, are crustaceous. They experience a complete metamorphosis.

In the sixth or the ORTHOPTERA, there are six legs; four wings, the two superior in the form of cases, and mandibles and jaws for mastication, covered at the extremity by a *galea;* the inferior wings

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* Twisted wings. The parts taken for elytra are not so. See this order.

† Wings folded like a fan.

‡ Destitute of wings and scutellum.

are folded in two directions, or simply in their length, and the inner margins of the cases, usually coriaceous, are crossed. They only experience a semi-metamorphosis.

In the seventh or the HEMIPTERA, there are six legs and four wings, the two superior in the form of crustaceous cases, with membranous extremities, or similar to the inferior, but larger and firmer; the mandibles and jaws are replaced by setæ forming a sucker, enclosed in a sheath composed of one articulated, cylindrical, or conical piece, in the form of a rostrum.

In the eighth or the NEUROPTERA, there are six legs, four membranous and naked wings, and mandibles and jaws for mastication; the wings are finely reticulated, and the inferior are usually as large as the superior, or more extended in one of their diameters.

In the ninth or the HYMENOPTERA, there are six feet, and four membranous and naked wings, and mandibles and jaws for mastication; the inferior wings are smaller than the others, and the abdomen of the female is almost always terminated by a terebra or sting.

In the tenth or the LEPIDOPTERA, there are six legs, four membranous wings, covered with small coloured scales resembling dust; a horny production in the form of an epaulette, and directed backwards, is inserted before each upper wing, and the jaws are replaced by two united tubular filaments, forming a kind of spirally convoluted tongue.

In the eleventh or the RHIPIPTERA, there are six legs, two membranous wings folded like a fan, and two crustaceous moveable bodies, resembling little elytra, situated at the anterior extremity of the thorax; the organs of manducation are simple, setaceous jaws, with two palpi.

In the twelfth or the DIPTERA, there are six, legs, twomembranous extended wings, accompanied, in most of them, by two moveable bodies or halteres, placed behind them; the organs of manducation are a sucker composed of a variable number of setæ inclosed in an inarticulated sheath, most frequently in the form of a proboscis terminated by two lips.

ORDER I.

MYRIAPODA.



The Myriapoda commonly called *Centipedes*, are the only animals of this class which have more than six feet in their perfect state, and whose abdomen is not distinct from the trunk. Their body, destitute of wings, is composed of a (usually) numerous suite of annuli, most commonly equal, each of which, a few of the first excepted, bears two pairs of feet mostly terminated by a single hook; these annuli are either entire or divided into two demi-segments, each bearing a pair of those organs, and one of them only exhibiting two stigmata.

The Myriapoda in general resemble little Serpents or Nereides, their feet being closely approximated to each other throughout the whole extent of the body. The form of these organs even extends to the parts of the mouth. The mandibles are bi-articulated and immediately followed by a quadrifid piece in the form of a lip with articulated divisions, resembling little feet, which, from its position, corresponds to the ligula of the Crustacea; next come two pairs of little feet, the second of which, in several, resemble large hooks, that appear to replace the four jaws of the last mentioned animals, or the two jaws as well as the lower lip of Insects: they are a sort of buccal feet. The antennæ, two in number, are short, somewhat thicker towards the extremity, or nearly filiform, and composed of seven joints in some; in others they are numerous and setaceous. Their visual organs are usually composed of a union of ocelli, and if in others they present a cornea with facets, the lenses are still larger, rounded, and more distinct, in proportion, than those of the eyes of Insects. The stigmata are frequently very small, and their number, owing to that of the annuli, is usually greater than in the latter where it never exceeds eighteen or twenty. The number of these annuli and that of the feet increase with age, a character which also distinguishes the Myriapoda from Insects, the latter always having the number of segments peculiar to them, and all their legs with hooks, or true legs, being developed at once, either at the same epoch or when they pass into their pupa state. The Myriapoda live and increase in size longer than other Insects.

From this accumulation of facts, we may conclude, that these animals approach the Crustacea and Arachnides on the one hand, and the Insects on the other; but that as respects the presence, form and direction of the branchiæ, they belong to the latter.

We divide them into two families, perfectly distinct both in their organisation and habits, and forming two genera according to the system of Linnæus.

FAMILY I.

CHILOGNATHA.

The body generally crustaceous and frequently cylindrical; the antennæ somewhat thicker near the end or nearly equal, and composed of seven joints; the two thick mandibles without palpi, very distinctly divided into two portions by a median articulation with imbricated teeth, implanted in a cavity of its superior extremity; a species of lip—ligula—situated immediately above, that covers them, is crustaceous, plane, and divided on its exterior surface by longitudinal sutures and emarginations into four principal areæ, tuberculated on their superior margin, the two intermediate of which, narrower and shorter, are placed at the superior extremity of another area, serving as a common base: the feet very short, and always terminated by a single hook.

The Chilognatha move very slowly, or slide along, as it were, and roll themselves spirally or into a ball. The first segment of the body, and in some the following one, is the largest, and has the form of a corselet or little shield. It is only at the fourth, in some, and at the fifth or sixth in others, that the duplication of the feet commences; the first two or four feet are even entirely free to their origin, where they merely adhere to their respective segments by a median or sternal line. The last two or three rings are without feet. A series of pores are observed on each side of the body, which were considered as stigmata, but, according to Savi, they are simply designed to afford a passage to an acid fluid of an extremely disagreeable odour, which appears to serve as a means of defence; the respiratory apertures, for whose discovery we are indebted to him, are situated on the sternal part of each segment, and communicate internally with a double series of pneumatic sacs strung together like a rosary, extending along the body, from which proceed tracheal branches that ramify over the other organs. According to an observation of Straus, the sacs or vesicular tracheæ are not, as usual, connected with each other by a principal trachea.

These Insects feed on dead and decomposed animal and vegetable matters: they deposit in the ground a great number of eggs. According to the system of Linnæus they form but one genus, that of

Iulus, *Linnæus.*

Some have a crustaceous body without terminal appendages, and antennæ enlarged near the end.

Glomeris, *Latreille.*

Resembling Onisci; oval, and rolling into a ball; the body convex above, and concave underneath, with a range of little scales analogous to the lateral

divisions of the Trilobites along each of its inferior sides. These animals are terrestrial, and live under stones in hilly places.

Iulus, *Linnæus.*

The body of the true Iuli is cylindrical and very long, and has no ridge or trenchant edge on the sides of the annuli; they roll themselves up spirally.

The larger species live on land, particularly in the woods and sandy places, and diffuse a very disagreeable odour. The smallest ones feed on fruit, or the roots and leaves of esculent vegetables. Others are found under the bark of trees, in moss, &c. There are two other genera, viz. *Polydesmus* and *Polyxenus.*

FAMILY II.

CHILOPODA.

The antennæ of the Chilopoda are more slender towards the extremity, and consist of fourteen joints and upwards. Their mouth is composed of two mandibles furnished with a little palpiform appendage, which seem to have been soldered in the middle, and terminate like the bowl of a spoon with dentated edges; of a quadrifid lip, of two palpi or little feet, and of a second lip formed by a second pair of feet, dilated and united at base, and terminated by a stout moveable hook, whose inferior extremity is perforated by a hole which affords an issue to a venomous fluid.

The body is depressed and membranous. Each of its rings is covered with a coriaceous or cartilaginous plate, and most generally bears but a single pair of feet; the last is usually thrown backwards, and elongated into a kind of tail. The organs of respiration are wholly, or partly, composed of tubular tracheæ.

These animals run very fast, are carnivorous, avoid the light, and conceal themselves under stones, logs, in the ground, &c. They are much dreaded by the inhabitants of hot climates, where they are very large, and where their venom is possibly more active. The *Scolopendra morsitans* is styled in the Antilles the *malfaisante.* Some of them exhibit phosphorescent properties.

The Chilopoda, which, in the system of Leach, form the order *Syngnatha,* from these last characters, the nature of the respiratory organs and the feet, may be thus divided:

Some have but fifteen pairs of feet, and their body viewed from above presents fewer segments than when seen from beneath.

Scutigera, *Lamarck.*

The body covered with eight scutelliform plates. The under part of the body is divided into fifteen semi-annuli, each bearing a pair of feet, terminated by a very long, slender, multi-articulated tarsus; the last pairs are more elongated; the eyes large and compound.

Their antennæ are slender and tolerably long; the two palpi salient and furnished with small spines. The body is shorter than in the other genera of the same family, and the joints of their feet are proportionably longer. They are extremely agile animals, and frequently part with some of their feet when seized.

LITHOBIUS, *Leach.*

The stigmata lateral; body divided above and beneath into a similar number of segments, each bearing a pair of feet; the superior plates alternately longer and shorter, and overlapping each other close to the extremity.

The others have at least twenty-one pairs of feet, and the segments both above and underneath are equal in size and number.

SCOLOPENDRA, *Linnæus.*

Those which form the two feet that immediately follow the two hooks forming the exterior lip, present but twenty-one pairs, and whose antennæ have seventeen joints, constituting the genera *Scolopendra* and *Crytops* of Leach. There are eight distinct eyes, four on each side in the first, and that in which the largest species are found; in the second, they are null or but very slightly visible.

The southern departments of France and other countries of the South of Europe produce a species nearly as large as the common *Scolopendra* of the Antilles, but having the body more flattened. This is the *S. cinjulata* of Linnæus. The species which form the genus *Crytops*, Leach, have rougher antennæ than the *Scolopendræ;* the two posterior feet are also more slender.

ORDER II.

THYSANOURA.

THIS order consists of apterous Insects, supported by six feet, that experience no metamorphosis, and have, in addition, particular organs of motion either on the sides or the extremity of the abdomen.

FAMILY I.

LEPISMENÆ, *Latreille.*

SETIFORM antennæ divided from their origin into very numerous and small joints; mouth furnished with very distinct and salient palpi; each side of the under part of the abdomen provided with a range of moveable appendages, in the form of false feet; abdomen terminated by articulated setæ, three of which are the most remarkable; body always covered with small shining scales.

It comprises but one genus, the

LEPISMA, *Linnæus.*

The body of these animals is elongated and covered with small scales, frequently silvery and brilliant, from which circumstance the most common species has been compared to a little fish. The antennæ are setaceous and usually very long. The feet are short, and frequently have very large and strongly compressed coxæ resembling scales.



Several species conceal themselves in the cracks and in the frame work of windows, under damp boards, in wardrobes, &c. Others retire under stones.

These insects run with great velocity; some of them by means of their caudal appendages are enabled to leap. They are divided into two subgenera, MACHILIS, Lat., and LEPISMA, Lin.

FAMILY II.

PODURELLÆ, *Latreille.*

ANTENNÆ quadriarticulated; no distinct or salient palpi; abdomen terminated by a forked tail folded under the venter when at rest, and used for leaping. The Podurellæ form but one genus in the Linnæan system.

PODURA, *Linnæus.*

These insects are very small, soft, and elongated, with an oval head and two eyes, each composed of eight granules. Their legs have but four distinct joints. The tail is soft, flexible, and formed of an inferior piece, moveable at base; to the extremity of which are articulated two appendages susceptible of being approximated, separated, or crossed—they are the teeth of the fork. They have the faculty of elevating their tail, and then forcing it suddenly against the plane of position, as if they let go a spring, thus raising themselves into the air, and even leaping like the Pulices, but to a less height. They usually fall on their back, with their tail extended posteriorly. The middle of the venter exhibits a raised oval portion divided by a slit.

Some keep on trees and plants, under old pieces of bark, or stones; others on the surface of stagnant waters, and sometimes on that of snow during a thaw. Several unite in numerous societies on the ground, and at a distance resemble little heaps of gunpowder. We divide them into PODURA and SMYNTHURUS, Lat.: the former having the antennæ equal, and without annuli or little joints to the last segment, embracing the *P. arborea*, *P. nivalis*, &c.; the latter having the antennæ more slender near the extremity, and terminated by an annulated piece composed of little joints, to which belongs the *P. atra* *P. viridis*, &c.

ORDER III.

PARASITA.



The Parasita, so called from their parasitical habits, have but six legs, and are apterous, like the Thysanoura; but their abdomen is destitute of articulated and moveable appendages. Their organs of vision consist of but four or two ocelli; a great portion of their mouth is internal, exhibiting externally either a snout or projecting mammilla, containing a retractile sucker, or two membranous and approximated lips with two hooked mandibles. According to Linnæus, they form but one genus, that of

Pediculus, *Linnæus.*

Their body is flattened, nearly diaphanous, and divided into twelve or eleven distinct segments, three of which belong to the trunk, each bearing one pair of legs. The first of these segments frequently forms a sort of thorax. The stigmata are very distinct. The antennæ are short, equal, composed of five joints, and frequently inserted in a notch. There are one or two small ocelli on each side of the head. The legs are short, and terminated by a very stout nail, or two opposing hooks, which enable these animals to cling with great facility to the hairs of quadrupeds, or to the feathers of birds, whose blood they suck, and on whose bodies they pass their lives. They attach their ova to these cutaneous appendages. These insects always live on the same quadrupeds and on the same birds, or at least on animals of these classes, which have analogous characters and habits. Two species frequently live on the same bird. Their gait in general is very slow.

This genus now forms several subgenera. They include the various species of *lice* found on man, birds, &c.

ORDER IV.

SUCTORIA.



The Suctoria, which constitute the last order of the Aptera, have a mouth composed of three pieces, enclosed between two articulated laminæ, which, when united, form a cylindrical or conical proboscis or rostrum, the base of which is covered by two scales. These characters exclusively distinguish this order from all others, and even from that of the Hemiptera, to which, in these respects, it approximates the most closely, and in which these insects were placed by Fabricius. The Suctoria,

besides, undergo true metamorphoses, analogous to those of several Diptera, such as the Tipulæ.

This order consists of a single genus, that of

Pulex, *Linnæus.*

The body of the *Flea* is oval, compressed, invested by a firm skin, and divided into twelve segments, three of which compose the trunk, that is short, and the others the abdomen. The head is small, strongly compressed, rounded above, and truncated and ciliated before; it is furnished on each side with a small rounded eye, behind which is a fossula, in which we discover a little moveable body furnished with small spines. The legs are strong, the last ones particularly, fitted for leaping, and spinous; the coxa and femur are large; the tarsi is composed of five joints, the last terminating in two elongated hooks; the two anterior legs are inserted almost under the head, the rostrum being placed midway between them.

The female lays a dozen of white and slightly viscid eggs; the larvæ have no feet, are much elongated, resemble little worms, and are extremely lively, rolling themselves into a circle or spirally, and crawl with a serpentine motion; they are first white and then reddish. Their body is composed of a scaly head, without eyes, bearing two very small antennæ; and of thirteen segments, with little tufts of hairs, the last one terminated by two kinds of hooks. Some small moveable pieces are observed in the mouth, by which these larvæ push themselves forwards. After remaining twelve days under this form, they enclose themselves in a little silky cocoon, in which they become pupæ, and from which, in about the same time, they issue in their perfect state.

These are various species that live on quadrupeds, birds, &c.

ORDER V.

COLEOPTERA.

Coleopterous insects have four wings, the two superior of which resemble horizontal scales, joining in a straight line along the inner margin; the inferior wings are merely folded transversely and covered with others, which form *cases* or *covers* for them, usually denominated the *elytra*.



Of all insects, these are the most numerous and the best known. The singular form and brilliant colouring of many species, the volume of their bodies, the greater solidity of their teguments, which facilitates their preservation, the numerous advan-

tages, which the study derives from the forms of their external organs, &c., have secured to them the particular attention of naturalists.

Their head presents antennæ of various forms, and almost always composed of eleven joints; two compound eyes, but none simple; and a mouth consisting of a *labrum*, *two mandibles*, usually of a scaly substance, *two jaws*, each furnished with one or two palpi, and of a *labium* formed of two pieces, the *mentum* and the *ligula*, and accompanied by two palpi, commonly inserted into the latter. Those of the jaws, or when they have two, the exterior ones, never consist of more than four joints; those of the lip usually have three.

The anterior segment of the trunk, or that which is before the wings, usually called the thorax, bears the first pair of legs, and is much larger than the two other segments. The latter are intimately united with the base of the abdomen, and their inferior portion or *pectus* gives insertion to the second and third pairs of legs. The second, on which the *scutellum* is placed, is narrowed before, and forms a short pedicle which fits into the interior of the first, and serves as a pivot, on which it moves.

The elytra and wings arise from the lateral and superior edges of the metathorax. The elytra are crustaceous, and when at rest, join along their internal margin, and always horizontally. They almost always conceal the wings, which are wide and transversely folded. Several species are apterous, but the elytra still exist. The abdomen is sessile or united to the trunk in its greatest width. It is composed externally of six or seven annuli, membranous above, or less solid than underneath. The number of joints in the tarsi varies from three to five.

The Coleoptera undergo a complete metamorphosis. The larva resembles a worm, having a scaly head, a mouth analagous to that of the perfect insect in the number of its parts, and usually six feet. Some few species are destitute of them, or have merely simple mammillæ.

The pupa is inactive and takes no nourishment. The habitations, mode of life, and other habits of these insects, in both states, vary greatly.

I divide this order into four sections, according to the number of joints in the tarsi.

The first comprises the PENTAMERA, *or those in which all the tarsi consist of five joints*, and is composed of six families.

FAMILY I.

CARNIVORA. *Adephagi*

Two palpi to each maxilla, or six in all; antennæ almost always filiform or setaceous, and simple.

The maxillæ are terminated by a scaly hook or claw, and the interior side is furnished with cilia or little spines. The ligula is fixed in an emargination of

the mentum. The two anterior legs are inserted on the sides of a compressed sternum, and placed on a large platilla; the two posterior have a stout trochanter at their origin; their first joint is large, appears to be confounded with the postpectus, and forms a curvilinear triangle, with the exterior side excavated.

These insects pursue and devour others. Several have no wings under their elytra. The anterior tarsi in most of the males are dilated or widened.

The larvæ also are very carnivorous. Their body is usually cylindrical, elongated, and composed of twelve rings; the head, which is not included in this supputation, is large, squamous, armed with two stout mandibles, recurved at the point, and presents two short and conical antennæ, two maxillæ divided into two branches, one of which is formed by a palpus, a ligula bearing two palpi, shorter than the others, and six ocelli on each side. The first annulus is covered by a squamous plate; the others are soft or have but little firmness. Each of the three first bears a pair of legs, the extremity of which curves forwards.

These larvæ differ according to the genus. In those of the Cicindelæ and of the Aristus bucephalus, the top of the head is very concave in the middle, whilst its inferior portion is convex. They have two ocelli, on each side, much larger, and similar to those of the Lycosæ. The superior plate of the first segment is large, and forms a semicircular shield. There are two hooked mammillæ on the back of the eighth annulus; the last has no remarkable appendage.

In the other larvæ of this family which are known to us, those of Omophron excepted, the head is weaker and more equal. The ocelli are very small and similar. The squamous piece of the first ring is square, and does not project from the body. There are no mammillæ on the eighth; and the last is terminated by two conical appendages, exclusive of a membranous tube formed by the prolongation of the end of the body. These appendages, in the larvæ of Calosoma and Carabas, are horny and dentated. In those of Harpalus and Licinus, they are fleshy, articulated, and longer. The body of the larva of a Harpalus is somewhat shorter, and the head a little larger. The mandibles of both approach the form of those of the perfect insect.

Some are aquatic, others terrestrial.

The latter have legs exclusively adapted for running, the four posterior of which are inserted at equal distances; mandibles completely exposed; the terminal piece of the maxillæ straight ineriorly, and only curved at its extremity; and most frequently an oblong body with projecting eyes. All their tracheæ are tubular or elastic.

They are divided into two tribes. The first or the CICINDELETÆ, Lat., comprises the genus

CICINDELA, *Linnæus*,

In which the extremity of the maxillæ is provided with a little nail articulated with it by its base.

The head is large, with great eyes, and very projecting and dentated man-

dibles; the very short ligula is concealed behind the mentum. The labial palpi are distinctly composed of four joints, and generally pilose, as well as those of the maxillæ.

This great Linnæan genus now forms various subgenera, such as *Manticora*, *Megacephala*, &c. The true Cicindela or

Cicindela, *Latreille*,

Are usually of a darker or lighter green, mixed with various brilliant metallic tints; the elytra are marked with white spots. They prefer dry, warm situations, run with considerable swiftness, take wing the moment they are approached, but alight at a short distance. If pursued they have recourse to the same means of escape.

The larvæ of two species indigenous to France, the only ones that have been observed, excavate in the earth a deep cylindrical hole, an operation which they effect with their mandibles and feet. To empty it, they place the detached particles on their head, turn about, climb up the ascent little by little, resting at intervals and clinging to the walls of their domicile by means of their two dorsal mammillæ; when they arrive at the mouth of the aperture they throw down their burden. While in ambuscade, the plate of their head exactly closes the entrance of their cell, and is on a level with the ground. They seize their prey with their mandibles, and even dart upon it, and by a see-saw motion of their head precipitate it to the bottom of the hole. Thither also they quickly retreat on the least intimation of danger. If they are too confined, or the soil is not of a proper nature, they construct a new habitation elsewhere.

Such is their voracity that they devour other larvæ of the same species, which have taken up their abode in their vicinity. When about to change their tegument or to become pupæ, they close the opening of their cell.

The American Species of Cicindela are numerous and beautiful.

The second tribe, or the Carabici, Lat., comprehends the genus

Carabus, *Linnæus*,

Where the maxillæ simply terminate in a point or hook, without an articulated extremity.

Their head is usually narrower than the thorax, or, at most, of the same width; their mandibles, those of a few excepted, have no dentations or but very few; the ligula usually projects, and the labial palpi exhibit but three free joints. Many of them are destitute of wings, only having elytra. They frequently diffuse a fetid odour, and eject an acid and caustic liquid. Geoffroy believed that the ancients designated Carabici under the name of *Buprestes*, insects which they considered as highly poisonous, particularly to oxen.

The Carabici conceal themselves in the ground, under stones, chips, bark of old trees, &c., and are mostly very active. Their larvæ have the same habits. This tribe is very numerous, and forms a most difficult study.

The Carabici are now variously subdivided. Each section consisting of numerous genera. We find,

1. The Truncatipennes, so called because the posterior extremity of their

elytra is almost always truncated. The head and thorax are narrower than the abdomen. The ligula is most commonly oval or square, and is rarely accompanied on the sides by salient divisions.

This section consists of *Anthia*, *Graphipterus*, *Aptinus*, *Brachinus*, *Casnonia*, &c.

2. The Bipartiti, which in relation to their habits might also be styled *Fossores*, is composed of Carabici with elytra either entire or slightly insinuated at their posterior extremity; having frequently granose and geniculate antennæ; a broad head, large thorax, usually shaped like a cup or almost semi-orbicular, and separated from the abdomen by an interval which causes the latter to appear pediculated; the legs generally but slightly elongated, their tarsi usually short, and similar in the two sexes, or nearly so, without any brush beneath, and simply furnished with ordinary hairs or cilia. The two anterior tibiæ are dentated, and in several palmated or digitated; the mandibles frequently strong and dentated. There is a tooth in the emargination of the mentum. They all keep on the ground, conceal themselves either in holes which they excavate, or under stones, and frequently only leave their retreat at night.

They are usually of a uniform black. The larvæ of the Ditomus bucephalus, the only one that has been observed, has the form and mode of life of the larvæ of the Cicindelæ. They are more particularly proper to hot countries.

The genera are *Enceladus*, *Siaquona*, *Pasimachus*, *Scarites*, &c. &c.

3. The Quadrimani, includes those, otherwise similar to the last in the pointed termination of the posterior extremity of their elytra, in the males of which the four anterior tarsi are dilated; the three or four first joints are in the form of a reversed heart or triangular, and nearly all terminated by acute angles; they are usually furnished underneath (the Ophoni excepted) with two ranges of papillæ or scales, with an intermediate linear space.

The body is always winged, and generally oval and arcuated or convex above; the thorax is wider than it is long, or at most nearly isometrical, square or trapezoidal. The head is never suddenly contracted posteriorly, and the antennæ are equal throughout, or slightly and insensibly thickened near the extremity. The mandibles are never very strong. The exterior palpi are terminated by an oval or fusiform joint, longer than the preceding one. The tooth of the emargination of the mentum is always entire, and in some is wanting. The legs are robust, the tibiæ spiny, and the hooks of the tarsi simple. The intermediate tarsi, even in the females, are short, and, with the exception of the dilatation, nearly formed like the anterior. These Carabici prefer sandy and hot localities.

Here we have, *Acinopus*, *Daptus*, *Harpalus*, &c.

4. The Simplicimani approaches the preceding in the manner in which the elytra are terminated; but the two anterior tarsi alone are dilated in the males, without however forming a square or orbicular palette; sometimes the three first joints are much wider, and in this case the succeeding one is always smaller than its antecedent; sometimes the latter and the two preceding ones are larger, almost equal, and in the form of a reversed heart or triangular; the first joints of the four following tarsi are more slender and

elongated, almost cylindrical, or in the form of an elongated and reversed cone.

The genera are *Zabrus*, *Pogonus*, *Feronia*, &c.

5. The Patellimani, distinguished from the Simplicimani, by the manner in which the two anterior tarsi of the males are dilated, the first joints—usually the three first, then the fourth, and sometimes only the two first—all of which are sometimes square, and at others only in part, the remainder being cordiform, or resembling a reversed triangle, but always rounded at their extremity, and not terminated as in the preceding sections by acute angles, form an orbicular palette or long square, the inferior surface of which is usually furnished with brushes or crowded papillæ, without any intermediate vacancy.

The legs are generally slender and elongated, and the thorax is frequently narrower than the abdomen, throughout its whole length. Most of them frequent the shores of rivers, or other aquatic localities.

The genera are, *Dolichus*, *Agonus*, *Chlænius*, *Dicælus*, &c. &c.

6. The Grandipalpi, whose anterior tibiæ have no emargination on the internal side, or which present one that begins close to their extremity, or that does not extend on their anterior face, and forming a mere oblique and linear canal. The ligula is often extremely short, terminated in a point in the middle of its summit, and accompanied by pointed paraglossæ. The mandibles are robust. The last joint of the exterior palpi is usually larger, compressed into the form of a reversed triangle, or securiform in some, and almost into that of a spoon in others. The eyes are prominent. The elytra are entire or simply sinuous at their posterior extremity. The abdomen, compared with the other parts of the body, is voluminous. They are generally large insects, are ornamented with brilliant metallic colours, run very fast, and are extremely carnivorous.

In this section we have *Pamborus*, *Cychrus*, *Scaphinotus*, *Procerus*, *Calosoma*, and

Carabus, *Linnæus*, *Fabricius*,

Or Carabus properly so called. The labrum is simply emarginate or bilobate; tooth of the emargination of the mentum entire.

Count Dejean describes one hundred and twenty-four species, which he has arranged in sixteen divisions. The first thirteen comprise those whose elytra are convex or arched, and the three last those in which they are plane.

The greater number of these species inhabit Europe, Caucasus, Siberia, Asia Minor, Syria, and the north of Africa to the thirtieth degree of north latitude. Some few are also found at the two extremities of America, and it is probable that others may be found in the intermediate mountains *.

* Of the species that inhabit North America, we have as yet only discovered the *C. Beauvoisi*, *carinatus*, *Lherminier ?*, *lineatopunctatus* (*serratus*, Say), *sylvosus* and *vinctus*. The mountains of New Hampshire, and Maine particularly, probably contain several others, and it is to be hoped that some friend of the science, within reach of those localities, will soon enable *us* to enlarge our catalogue of this interesting genus, as well as that of others found in the same localities.—*Am. Ed.*

The Pentamerous Aquatic Carnivora form a third tribe, that of the HYDROCANTHARI, Lat. The feet of these insects are fitted for natation; the four last are compressed, ciliated, or laminiform, and the two last at a distance from the others; the mandibles are almost entirely covered; the body is always oval, the eyes but slightly prominent, and the thorax much wider than long. The terminal hook of the maxillæ is arcuated from its base; those at the extremity of the tarsi are often unequal.

They compose the genera *Dytiscus* and *Gyrinus* of Geoffroy. They pass their first and last stage of existence in the fresh and placid waters of lakes, marshes, ponds, &c. They are good swimmers, and rise occasionally to the surface of their liquid abodes in order to respire; this they easily effect by keeping their legs motionless, and permitting themselves to float. Their body being reversed, they elevate its posterior extremity a little above the water, raise the extremity of their elytra, or depress the end of the abdomen, in order that air may enter the stigmata, which are covered by them, whence it finds its way to the tracheæ. They are excessively voracious, and feed on small animals inhabiting the same element, which they never leave except during the night, or at its approach. When taken from the water they diffuse a nauseating odour. They are frequently attracted into houses by the light of candles, &c.

Their larvæ have a long and narrow body composed of twelve rings, the first of which is the largest; a stout head, provided with two powerful mandibles, curved into an arc, and perforated near the point; small antennæ, palpi, and six simple approximated eyes on each side. They have six tolerably long legs, frequently fringed with hairs, and terminated by two small nails. They are active, carnivorous, and respire either at the extremity or by a kind of fins resembling branchiæ. When about to enter into their pupa state they leave the water.

This tribe consists of two principal genera.

DYTISCUS, *Geoffroy.*

The Dytisci have filiform antennæ longer than the head, two eyes, the anterior legs shorter than the following ones, and the last most commonly terminated by a compressed tarsus ending in a point. By means of their legs fringed with long hairs, the two last particularly, they are enabled to swim with great velocity. They dart upon other insects, aquatic worms, &c. In most of the males the three first joints of the four anterior tarsi are widened and spongy underneath; those of the first pair particularly are very remarkable in the larger species, these three joints forming there a large palette, the inferior surface of which is covered by little bodies, some in the form of papillæ, and others, larger, in that of cups or suckers, &c. The body of the larva is composed of from eleven to twelve annuli, and covered with a squamous plate; this larva is long, ventricose in the middle, and slender at each end, particularly behind, where the last annuli form an elongated cone furnished on the sides with a fringe of floating hairs, with which the animal acts on the water,

and propels its body forward; the latter is usually terminated by two conical, bearded, and moveable filaments.

These larvæ suspend themselves on the surface of the water by means of two lateral appendages at the extremity of their body, which they keep above it. When they wish to change their position, they communicate a sudden vermicular motion to their body, and strike the water with their tail. They feed more particularly on the larvæ of the Libellulæ, and those of the Culices and Aselli. When the period of their metamorphosis has arrived, they issue from the water, and having gained the shore, penetrate into the earth, which must, however, be constantly moistened, or very humid. They then excavate an oval cavity, and shut themselves up in it.

According to Rœsel, the eggs of the *D. marginalis* are hatched from ten to twelve days after they are laid. In four or five days after this epoch, the larva is already five lines in length, and undergoes its first change of tegument. The second ensues at the expiration of a similar period, and the animal is then double its former size. Its final length is two inches. They have been observed, in summer, to enter into their pupa at the end of fifteen days, and to become perfect insects in fifteen or twenty more.

This great genus is now divided into several, *Dytiscus proper*, *Colymbetes*, *Hygrobia*, &c.

The second genus of the Hydrocanthari, or the

Gyrinus, *Linnæus*,

Comprises those in which the antennæ are clavate and shorter than the head; the two first legs are long and project like arms; the remaining four are compressed, wide, and pinnate. There are four eyes.

The body is oval and usually very glossy. The second joint of the antennæ, which are inserted in a cavity before the eyes, is prolonged exteriorly in the form of an auricle, and the following joints are very short, crowded, and united in one almost fusiform and slightly curved mass. The head is sunk in the thorax almost to the eyes, which are large, and divided by a border, in such a way that two are above and two underneath. The labrum is rounded and strongly ciliated before. The palpi are very small, and the interior of those attached to the maxillæ are wanting, or are not developed in several, and particularly the larger species. The thorax is short and transversal. The elytra are obtuse and truncated at their posterior extremity, leaving the extremity exposed, which ends in a point. The two anterior legs are long, slender, folded in two, and when contracted, almost at a right angle with the body; they are terminated by a very short, strongly compressed tarsus, the inferior surface of which, in the males, is furnished with a fine compact brush. The four others are broad and extremely thin, the joints of their tarsi forming little leaflets arranged like a flounce.

The Gyrini are usually small, or of a moderate size. They are to be found from the very beginning of spring until the end of autumn, on the surface of stagnant waters, and even on that of the ocean, where, frequently collected in

troops, they appear like brilliant points, swimming and wheeling with great agility in all sorts of curves, and in every direction, whence the name of *Puce aquatique* and *Tourniquet* given to them by authors. Sometimes they remain motionless, but the instant any one approaches, they escape, by swimming, and dive with great celerity. Their four last legs serve them as oars, and the two before for seizing their prey. Placed on water, the superior surface of their body is always dry, and when they dive, a little bubble of air, resembling a silvery globule, remains fixed to its posterior extremity. When seized, a lacteous fluid oozes from their body which spreads over it, and which, perhaps, produces that disagreeable and penetrating odour they then diffuse, and which remain attached to the fingers for a long time. Sometimes they remain at the bottom of the water clinging to plants: there, also, it is probable they secrete themselves to pass the winter.

FAMILY II.

BRACHELYTRA. Brachyptera

In the second family of the Pentamerous Coleoptera we find but one palpus to the maxillæ, or four in all; the antennæ, sometimes of equal thickness, and at others slightly enlarged at the end, are usually composed of lenticular or graniform joints; the elytra are much shorter than the body, which is narrow and elongated, and the coxæ of the two anterior legs are very large; near the extremity of the abdomen are two vesicles which the animal protrudes at will.

These Coleoptera compose the genus

STAPHYLINUS, *Linnæus.*

The Staphylini have been considered as forming the passage from the Coleoptera to the *Forficulæ*, the first genus of the following order. They commonly have a large flattened head, stout mandibles, short antennæ, a thorax as wide as the abdomen, and the elytra truncated at the extremity, but still covering the wings, which preserve their usual extent. The semi-annuli of the top of the abdomen are as scaly as those of the venter. The vesicles of the extremity consist in two conical and pilose points, which are protruded and retracted at the will of the animal; a subtile vapour escapes from them, which, in some species, has a strong odour of sulphuric ether.

These insects, when touched, or while they run, elevate the extremity of their abdomen and flex it in every direction. They also use it to push their wings under the elytra. The tarsi of their two anterior legs are frequently broad and dilated, and their coxæ, as well as those of the intermediate legs, are very large. They are usually found in earth, and other matters; some live in mushrooms, rotten wood, or under stones; others are only met with in aquatic localities. Some very small ones keep on flowers. They are all voracious, run with great swiftness, and take wing very promptly.

The larva bears a close resemblance to the perfect insect: it has the figure

of an elongated cone, the base of which is occupied by the very large head; the last ring is prolonged into a tube, and is accompanied by two conical and hairy appendages. It feeds on the same matters as the perfect insect.

This genus is very extensive and is now divided into six sections, viz. The Fissilabra, where we find the *true Staphylini*, the Longipalpi, the Dentirura, the Depressa, and the Microcephala. Each of these sections consists of various genera. The species are excessively numerous.

FAMILY III.

SERRICORNES*.

In the third family of pentamerous Coleoptera, as in the preceding and following families of the same order, we find but four palpi. The elytra cover the abdomen, which, with some other characters, distinguish the insects which compose it from the Brachelytra just mentioned. The antennæ, with some exceptions, are equal throughout, or smaller at the extremity, dentated, either like a saw or a comb, or even like a fan, and in this respect are most developed in the males. The penultimate joint of the tarsi is frequently bilobate or bifid. These characters are rarely found in the following family, that of the Clavicornes, to which we arrive by such insensible gradations, that to define its limits rigorously becomes a very difficult matter.

Some, in which the body is always firm and solid, and most commonly oval or elliptical, with partly contractile legs, have the head plunged vertically into the thorax up to the eyes; and the præsternum, or median portion of the thorax, elongated, dilated, or reaching to beneath the mouth, usually distinguished on each by a groove in which the antennæ—always short—are lodged, and prolonged posteriorly into a point, which is received into a depression of the anterior extremity of the mesosternum. These anterior legs are at a distance from the anterior extremity of the thorax. They form a first section, or that of the Sternoxi.

Others, whose head is enclosed posteriorly by the thorax, or at least covered by it at base, but in which the præsternum is not dilated, and does not project anteriorly in the manner of a chin-cloth, and is not usually terminated posteriorly in a point received into a cavity in the mesosternum, and in which the body is most commonly either entirely or partially soft and flexible, constitute a second section, that of the Malacodermi.

A third and last, that of the Xylotrogi, will comprise those Serricornes, in which the posterior extremity of the præsternum is not similarly prolonged, but whose head is completely exposed and separated from the thorax by a strangulation or species of neck.

We will divide the *Sternoxi* into two tribes. In the first, or that of the Buprestides, the posterior projection of the præsternum is flattened, and not

* Saw-horned.

terminated in a laterally compressed point, that is simply received into a depression or emargination of the mesosternum. The mandibles frequently terminate in an entire point, without any fissure or emargination. The posterior angles of the thorax are either but very slightly or not at all prolonged. The last joint of the palpi is most commonly nearly cylindrical, hardly thicker than the preceding; the others are globular or ovoid. Most of the tarsal segments are generally wide or dilated, and furnished beneath with pellets. These insects never leap, a character which eminently distinguishes them from those of the following tribe: they compose the genus

Buprestis, *Linnæus.*

The generic appellation of *Richard*, given to these Coleoptera by Geoffroy, intimates the richness of their livery. Several of the European species, and many that are foreign to that country, besides their size, are remarkable for a brilliant polished gold colour on an emerald ground; in others, an azure blue glistens over the gold, or there is a union of several other metallic colours. Their body, in general, is oval, somewhat wider and obtuse, or truncated before, and narrowed behind from the base of the abdomen, which occupies the greater part of its length. The eyes are oval, and the thorax is short and wide. The scutel small or null. The extremity of the elytra is more or less dentated in many. The legs are short.

They walk very slowly, but fly well in hot and dry weather. When about to be seized, they let themselves fall to the ground. At the posterior extremity of the abdomen of the females is a coriaceous, laminiform, conical appendage composed of three parts, the last annuli of the abdomen; it is probably an instrument with which they deposit their ova in dry wood, the habitat of their larvæ. Several small species are met with on leaves and flowers; most of the others, however, are found in forests and wood yards: they sometimes appear in houses, where they have been transported, in wood, in the state of a larva or chrysalis.

B. gigas, Lin. Two inches long; thorax cupreous, mixed with brilliant green, and two large smooth spots of burnished steel; elytra tridentate at the extremity, cupreous in the middle, bronze-green on the margin, with impressed puncta, and elevated lines and rugæ. Cayenne.

This beautiful and extensive genus is now divided into four genera, viz. *Buprestis proper*, *Trachys*, *Aphanisticus*, and *Melasis*. Numerous species are found in this country.

The second tribe or that of the Elaterides, which only differs essentially from the first in the posterior stylet of the præsternum, which terminates in a laterally compressed point, frequently somewhat arcuated and unidentate, that sinks at the will of the animal into a cavity of the pectus, situated immediately above the origin of the second pair of legs; and in the circumstance that these insects when placed on their back have the faculty of regaining their original position by bounding upwards. Most of them have mandibles emarginated or cleft at the end, palpi terminated by a triangular or securiform

joint, much larger than those which precede it, and the joints of the tarsi entire. This tribe only comprises the genus

Elater, *Linnæus*,

The body is usually narrower and more elongated than that of the Buprestides, and the posterior angles of the thorax are prolonged into a sharp point, in the form of a spine.

The common French name of these insects in *Scarabées à ressort*, and their Latin one, *Notopeda Elater*. When placed on their back, finding it impossible to regain their natural position on account of the shortness of their legs, they bound perpendicularly upwards until they fall on their feet. To execute this motion, they press the latter close to the body, lower their head and thorax, which has a free downward motion, then approximating this last to the postpectus, they forcibly press the point of the præsternum against the margin of the hole situated before the mesosternum, into which it sinks suddenly, as if by a spring. The thorax and its lateral points, the head and elytra, being violently propelled against the plane of position, particularly if it be solid and smooth, concur by their elasticity in causing the body to bound upwards. The sides of the præsternum are distinguished by a groove, where the antennæ, which are pectinated or bearded in several males, are partly lodged. The females have a species of elongated ovipositor with two lateral pieces pointed at the end, between which is the true oviduct.

The Elaterides are found on flowers, plants, and even on the ground; they lower their head in walking, and if any one approaches, let themselves fall, pressing their legs against their body.

The various subgenera of this tribe may be referred to two principal divisions. Those where the antennæ can be entirely received into the inferior cavities of the thorax constitute the first.

The second division includes all those whose antennæ are exterior or exposed.

Elater, properly so called.

The antennæ of the males are simply serrated.

E. noctilucus, Lin. Rather more than an inch long; dusky brown, with a cinereous down; a convex, yellow, round, shining spot on each side of the thorax near its posterior angles; elytra marked with lines of small punctures. From South America.

During the night, the thoracic spots diffuse a very strong light, sufficiently bright to enable one to read the smallest character, particularly if several of the insects be placed in the same vase. By it also the women of the country pursue their work; and ladies even use it as an ornament, placing it in their hair during the evening paseo. The Indians fix them to their feet to light them in their nocturnal journeys.

North America is extremely rich in this genus. The insect is usually called a *Snap-bug*.

Our second section, or that of the MALACODERMI, is divided into five tribes. In the first, or the CEBRIONITES, so named from the genus Cebrio of Olivier, on which all the others depend, the mandibles terminate in a simple or entire point, the palpi are of equal thickness or more slender at the extremity, the body is rounded and convex in some, oval or oblong, but arcuated above, and inclined anteriorly in others. It is usually soft and flexible; the thorax is transversal, widest at base, and its lateral angles acute, or in several even prolonged into spines. The antennæ are generally longer than the head and thorax. The legs are not contractile.

Their habits are unknown. Many of them are found on plants in aquatic localities. They may all be united in one genus, that of

CEBRIO, *Olivier, Fabricius.*

Some, which establish a connexion between this and the preceding tribe, which are even of as firm and solid a consistence as the Sternoxi, whose legs are never fitted for leaping, and whose body is generally an oblong oval, with the antennæ of the males either pectinated, flabellated, or serrated, the palpi filiform or somewhat elongated at the extremity, and the posterior angles of the thorax prolonged into an acute point, present mandibles projecting beyond the labrum, narrow, and highly arcuated or in the form of hooks. The labrum is usually very short, and emarginated or bilobate.

There, as in the Elaterides, the præsternum terminates posteriorly in a point, received into a cavity in the mesosternum.

The antennæ, which in the males of some species are long, are composed of eleven pectinated or serrated joints. The last joint of the palpi is almost cylindrical or forms a reversed cone.

This genus is now cut up into several, such as *Physodactylus, Anelastes, Sandalus, Rhipicera*, &c.

The second tribe of the Malacodermi, or that of the LAMPYRIDES, is distinguished from the first by the enlarged termination of the palpi, or at least those of the maxillæ, by their always soft, straight, depressed, or but slightly convex body, and by the thorax, sometimes semicircular, and at others nearly square or trapezoidal, that projects over the head, which it either entirely or partially covers. The mandibles are usually small, and terminate in a slender, arcuated, very acute point, that is generally entire. The penultimate joint of the tarsi is always bilobate, and the crotchets of the last have neither dentations nor appendages.

The females of some are apterous, or have but very short elytra. When seized, these insects press their feet and antennæ against their body, and remain as motionless as if they were dead. Several, thus situated, curve their abdomen underneath. They comprise the genus

LAMPYRIS, *Linnæus.*

Antennæ closely approximated at base, the head either exposed and prolonged anteriorly in the manner of a snout, or for the greater part, or entirely,

concealed under the thorax; eyes of the males large and globular; mouth small. Such are the characters of a first division of this tribe, which we will subdivide into those in which neither sex is phosphorescent, and those in which the females at least are possessed of that faculty. Both sexes of the former are provided with wings, have their head exposed, and frequently narrower and extended anteriorly, or in the form of a snout, and the thorax widened posteriorly with pointed lateral angles. The two or three ultimate annuli of their abdomen are destitute of that pale yellowish or whitish tint, that is always found on this part of the body in the true Lampyrides, and which announces their phosphorescence. The elytra, in several, widen behind, and are sometimes strongly dilated and rounded posteriorly, in the females particularly. They are densely punctured, and frequently reticulated.

The genera are *Lycus*, *Dictyoptera*, and *Omalisus*.

The other Lampyrides of our first division are distinguished from the preceding ones, not only by the want of a snout, by their head, which, in the males almost entirely occupied by the eyes, is entirely or for the greater part concealed under a semicircular or square thorax, but also by a very remarkable character, either common to both sexes, or peculiar to the females, that of being phosphorescent, whence the names of *Glow-worms*, *Fire-flies*, &c., given to these insects.

Their body is extremely soft, the abdomen particularly, which has the appearance of being plaited. The luminous matter occupies the inferior part of the last two or three annuli, which differ in colour from the rest, and are usually yellowish or whitish. The light they diffuse is more or less vivid, and greenish or whitish, like that of the different kinds of phosphorus. It seems that they can vary its action at pleasure, a fact particularly observable when they are seized or held in the hand. They live a long time in vacuum and in different gases, the nitrous acid, muriatic and sulphurous gases excepted, in which they soon expire. Placed in hydrogen gas, they, sometimes at least, detonate. They continue to live after the excision of the luminous portion of their abdomen, and the part thus separated preserves its luminous property for some time, whether it be submitted to the action of various gases, be placed in vacuum, or left exposed to the air. The phosphorescence depends on the softness of the matter, rather than on the life of the animal. When apparently extinct it may be reproduced by softening the matter with water. The Lampyrides emit a brilliant light when immersed in warm water, but in cold water it becomes extinguished: this fluid seems to be the only dissolving agent of the phosphoric matter. They are nocturnal insects.

In our second division of the Lampyrides, the antennæ are very remote at base; the head is neither prolonged nor narrowed anteriorly in the form of a snout, and the eyes are of an ordinary size in both sexes.

This division consists of the genera *Drilus*, *Telephorus*, *Silis*, &c.

In the third tribe of the Malacodermi, or the Melyrides, we find the palpi most commonly short and filiform; mandibles emarginated at the point; the body usually narrow and elongated; the head only covered at base by a flat or

but slightly convex thorax, generally square, or elongated and quadrilateral; joints of the tarsi entire, and the hooks of the last one unidentated or bordered with a membrane. The antennæ are usually serrated, and, in the males of some species, even pectinated.

Most of them are very active, and are found on flowers and leaves.

This tribe, which is a mere division of the genera *Cantharis* and *Dermestes* of Linnæus, will form the genus

Melyris, *Fabricius*,

Now consisting of the subgenera, *Malachius*, *Dasytes*, &c. &c.

The fourth tribe of the Malacodermi, that of the Clerii, is distinguished by the ensemble of the following characters. Two of their palpi at least project and are clavate. The mandibles are dentated. The penultimate joint of the tarsi is bilobate, and the first is very short or but slightly visible in several. The antennæ are sometimes nearly filiform and serrated, and at others insensibly enlarged near the extremity. The body is usually cylindrical, the head and thorax narrower than the abdomen, and the eyes emarginated.

Most of these Insects are found on flowers, some of the species on the trunks of old trees or in dry wood. Such of the larvæ as are known are carnivorous.

This tribe will comprise the genus

Clerus, *Geoffroy*.

Now divided into *Cylidrus*, *Tillus*, *Priocera*, &c. &c.

Clerus proper.

The maxillary palpi of the Cleri, properly so called, are terminated by a compressed joint in the form of a reversed triangle; the last of those that belong to the labium, which are larger than the others, is securiform. The antennal club is hardly longer than wide, and is composed of crowded joints; the third is longer than the second. The maxillæ terminate in a projecting and fringed lobe. The thorax is depressed anteriorly.

These Insects are found on flowers; their larvæ devour those of certain Bees.

C. apiarius. Blue; elytra red; traversed by three bands of deep blue, the last of which occupies the extremity. The larva devours that of our domestic Bee, and does much injury to hives.

C. alvearius. Almost like the preceding, but with a bluish-black spot on the scutel. It inhabits the nests of the *Mason Bees*—Osmia—of Réaumur, and feeds on their larvæ.

The type of the fifth tribe of the Malacodermi, or the Ptiniores, consists of the genus *Ptinus* of Linnæus, and of some other genera depending on, or which most closely approach it. The body of these Insects is of a tolerably firm consistence, sometimes almost ovoid or oval, and at others nearly cylindrical, but generally short and rounded at the two extremities. The head is

nearly globular or orbicular, and almost entirely received into a strongly arched or vaulted thorax, resembling a hood. The antennæ of some are filiform, or diminished towards the end, and are either simple, flabelliform, pectinated, or serrated; those of others terminate suddenly by three larger and much longer joints. The mandibles are short, thick, and dentated under the point. The palpi are very short and terminated by a larger and almost ovoid joint, or like a reversed triangle. The tibia are not dentated, and the spurs at the extremities are very small. There is but litttle variety in their colours, which are always dark. They are very small. When touched they counterfeit death, lower their heads, incline their antennæ, and contract their feet; in this apparent state of lethargy they remain for some time. Their motions are generally slow, and those that are winged rarely take to flight to escape. Their larvæ are very noxious to us, and bear a great resemblance to those of the Scarabæides. Their body, frequently curved into an arc, is soft and whitish; the head and feet are brown and squamous. Their mandibles are strong. With fragments of various substances, which they detach by gnawing, they construct a shell in which they become nymphs. Other species establish their domicil in the country, in old wood, and under stones; their habits are the same.

Such are the characters of the genus

Ptinus, *Linnæus.*

In some, the head and thorax, or the anterior half of the body is narrower than the abdomen; the antennæ are always terminated in the same manner, simple or but slightly serrated, and at least almost as long as the body.

The antennæ of the *true Ptini* are inserted between the eyes, which are protuberant or convex. Their body is oblong.

They are generally found in houses, and chiefly in granaries and inhabited places. Their larvæ destroy our herbaria and desiccated specimens of animals. The antennæ of the males are longer than those of the females, and in several species, these latter are apterous.

P. fur, Lin. One line and a half in length; light brown; antennæ as long as the body; a pointed projection on each side of the thorax, and between them two others, rounded and covered with a yellowish down; two transverse, greyish bands on the elytra, formed by hairs.

According to De Geer, it feeds on Flies and other dead Insects that fall in its way. The larvæ are very injurious to herbaria and other collections of natural history.

The remaining subgenera are *Gibbium, Ptilinus*, &c. We may more particularly notice the

Anobium, *Fabricius.*

The antennæ are terminated by three larger or longer joints, but the two penultimates are in the form of a reversed and elongated cone, and that of the end is oval or nearly cylindrical; they consist of eleven joints.

Several species of this genus inhabit the interior of our houses, where, in

their larva state, they are very noxious, attacking the timbers, furniture, books, &c., and piercing little round holes in them similar to those made by a very small gimlet. The larvæ of other species of Anobium attack flour, wafers, cabinets of Birds, Insects, &c.

Both sexes frequently summon each other by reiterated and rapid strokes of their mandibles against the wood they inhabit, and mutually answer the signal. Such is the cause of that noise, resembling the accelerated tick of a watch, which is so often heard, and which is superstitiously called the death-watch.

A. tesselatum, Fab. Three lines in length; a dead dusky brown, with yellowish spots formed by hairs; thorax smooth; elytra not striated.

A. pertinax. Blackish; thorax with a yellowish spot at each posterior angle, and near the middle of its base a compressed eminence divided anteriorly by a depression; elytra with punctured striæ. According to De Geer, it will permit itself to be roasted to death by a slow fire, rather than exhibit the least sign of life when it is seized.

There are other species.

The third and last section of the Serricornes, forming also a last tribe, that of the Xylotrogi, is distinguished from the two preceding ones, as we have already stated, by the entire freedom of the head; and consists of the genus

Xylotrog

Lymexylon, *Fabricius.*

Now consisting of *Atractocerus, Hylecœtus, Lymexylon, Cupes* and *Rhysodes.*

FAMILY IV.

CLAVICORNES*.

In the fourth family of the pentamerous Coleoptera, as in the third, we find four palpi, and elytra covering the superior surface of the abdomen, or its greater portion; but it differs in the antennæ, which are almost always thicker at the extremity, that even frequently forms a perfoliaceous or solid club; they are longer than the maxillary palpi, and their base is exposed, or barely covered. The legs are not natatory, and the joints of the tarsi, at least those of the posterior ones, are usually entire.

In their larva state, at least, they feed on animal matters.

We will divide this family into two sections: the common characters of the first of which are, antennæ always composed of eleven joints, longer than the head, not forming from the third a fusiform or nearly cylindrical club, and their second joint not dilated in the form of an auricle; last joint of the tarsi, as well as its hooks, of a moderate length, or small.

These Clavicornes are terrestrial, while those of our second section are

* Club-horned.

aquatic or shore Insects, thus leading to the Palpicornes, most of which inhabit water, and whose antennæ never consist of more than nine joints.

The first section will comprise several small tribes. The first, that of the Palpatores, in a natural series, should be placed near the Pselaphii and Brachelytra. Their antennæ, which are, at least, as long as the head and thorax, slightly enlarge towards the extremity, or are nearly filiform; their two first joints are longer than the following ones. The head is distinguished from the thorax by an ovoid strangulation.

The maxillary palpi project, are long and inflated at the extremity. The abdomen is large, oval or ovoid, and embraced laterally by the elytra. The legs are elongated, thighs clavate, and tarsal joints entire.

These Insects remain on the ground, under stones and other bodies. Some —the Scydmæni—frequent wet places. We will unite them in a single genus, that of

Mastigus.

Joints of the antennæ nearly in the form of a reversed cone, the first very long and the last ones hardly thicker than the others; the two last joints of the maxillary palpi forming an oval club; thorax almost ovoid; abdomen oval.

In all the following Clavicornes the head is generally sunk in the thorax, and the maxillary palpi are never at the same time so much projected and clavate; the ensemble of their physiognomy also exhibits other differences.

The genus Hister forms our second tribe, which we will name the Histeroides. Here the four posterior legs are more remote from each other at base than the two anterior, a character alone that distinguishes this tribe from all others of the same family. The legs are contractile, and the outer side of the tibiæ is dentated or spinous. The antennæ are always geniculate, and terminated by a solid club composed of crowded joints. The body is extremely firm, and usually forms a square or parallelopiped; the præsternum is frequently dilated anteriorly, and the elytra are as often truncated. The mandibles project, are strong, and frequently unequal as to size. The palpi are almost filiform, or slightly enlarged near the end, and terminated by an oval or ovoid joint.

These animals feed on cadaverous matters and decomposing vegetable substances, such as old mushrooms, &c.: some establish their domicil under the bark of trees. Their gait is slow, and their colour a brilliant black or bronze. Such of their larvæ as have been observed—those of the *cadaverinus*—feed on the same substances as the perfect Insect. Their body is glabrous, soft, and of a yellowish white, the head and first segment excepted, the dermis of which is brown or reddish; it is provided with six short legs, and is terminated posteriorly by two articulated appendages, and an anal and tubular prolongation; the squamous plate of the first segment is longitudinally canaliculated.

This tribe, as we have already stated, will consist exclusively of the genus

Hister, *Linnæus*,

Now consisting of *Hister proper*, *Hololepta*, *Abræus*, &c.

The legs of the other Clavicornes are inserted at an equal distance from each other. Those in which these organs are not contractile, and the tarsi at most can only be flexed on the tibiæ, whose mandibles are most commonly salient and flattened or not thick, and whose præsternum is never dilated anteriorly, will constitute five other tribes.

In the third tribe of this family, that of the SILPHALES, we find five distinct joints in all the tarsi, and the mandibles terminating in an entire point without emargination or fissure. The antennæ terminate in a club that is most commonly perfoliaceous and consisting of from four to five joints. The internal side of the maxillæ, in most of them, is furnished with a horny tooth. The anterior tarsi are frequently dilated, at least in the males. The exterior margin of the elytra of the greater number is marked by a groove with a well raised border.

This tribe is composed of the genus

SILPHA, *Linnæus*,

Now variously divided. The most interesting of these genera are

NECROPHORUS, *Fabricius*.

Their instinctive habit of burying the bodies of Moles, Mice, and other small Quadrupeds, have procured for them the names of *enterreurs* and *porte-morts*. When they find a dead animal of the above description, they work under it, and excavate a hole of sufficient dimensions to contain the body, which they gradually drag into it; in this body they deposit their ova, and thus the larvæ find their food in the very nidus in which they are hatched. They are long, and of a greyish white colour; the anterior segments are covered superiorly with a small, fulvous-brown, squamous plate, and the posterior with little elevated points. They are furnished with six feet and strong mandibles. When about to pass into the state of a chrysalis, they penetrate deeply into the earth, where they construct a cell, which they line with a viscid substance.

North America possesses one species, the *N. grandis*, which surpasses all others in size and beauty.

SILPHA, *Linnæus, Fabricius*.

The body of a true Silpha is almost scutiform and depressed, or but slightly elevated; thorax semicircular, truncated or very obtuse before; exterior margin of the elytra strongly recurved and canaliculated; palpi filiform, their last joint almost cylindrical, and in several terminating in a point. Most of them live in carrion, and thus diminish the quantity of its noxious effluvia. Some climb on plants, and particularly on the stems of wheat, where they find little Helices on which they feed. Others remain on high trees and devour caterpillars. The larvæ are all equally active, live in the same manner, and frequently in large societies. They bear a great resemblance to the

perfect Insect. Their body is flattened, and consists of twelve segments, with acute posterior angles; the posterior extremity is narrower and terminated by two conical appendages.

ARGYRTES, *Frœh.*—MYCETOPHAGUS, *Fabricius.*

The body tolerably thick, convex, and arcuated superiorly, not scutiform; thorax somewhat wider than long, and a little narrower before; exterior margin of the elytra inclined and not canaliculated, last joint of the maxillary palpi thicker and ovoid.

Certain Clavicornes, which seem to approach Argyrtes in their habits and other characters, but whose mandibles are cleft or bidentated at the extremity, will compose our fourth tribe, that of the SCAPHIDITES. Their tarsi consist of five very distinct and entire joints. The body is oval, narrowed at both ends, arcuated or convex above, and thick in the middle; the head low, and received posteriorly into a trapezoidal thorax, widest behind, the margin of which is but slightly or not at all recurved. The antennæ are usually at least as long as the head and thorax, and terminated in a quadriarticulated and elongated club. The last joint of the palpi is conical. The legs are elongated and slender. With the exception of some species—the Cholevæ—the tarsi are nearly similar in both sexes.

This tribe consists of the genus

SCAPHIDIUM.

In the true Scaphidia, the five last joints of the antennæ are almost globular, and compose the club. The maxillary palpi project but little, and gradually taper to a point, the penultimate joint not being thicker than the last at their junction. The body is navicelliform; the margin of the thorax slightly recurved, and the elytra truncated. They inhabit mushrooms. But few species are known; one from Cayenne and the rest from the north of Europe.

The subgenera are *Choleva* and *Mylœchus.*

The fifth tribe, or that of the NITIDULARIÆ, approximates to the fourth in the scutiform and bordered body, but the mandibles are bifid or emarginated at the extremity; the tarsi seem to consist of but four joints, the first and last, in some, being only visible beneath, where they merely form a slight projection, and the penultimate in the remainder being very small, in the form of a knot, enclosed between the lobes of the preceding ones. The antennal club is always perfoliaceous, consists of three or four joints, and is usually short or but little elongated.

The palpi are short and filiform, or somewhat thickest at the extremity. The elytra in several are short or truncated. The legs are but slightly elongated, and their tibiæ frequently widened at the end; the tarsi are furnished with hairs or pellets. The habitation of these Insects varies with the species; they are found on flowers, in mushrooms, putrefied meat, and under the bark of trees. They form the genus

Nitidula.

In some the antennal club consists of but two joints, and the anterior part of the head projects in the manner of a semicircular flattened clypeus, covering the mandibles and other parts of the mouth.

Colobicus, *Latreille*.

In this and the following subgenus, the tarsi, from the point where they are moveable, seem to consist of but four joints, of which the three first, much shorter than the last, are entire, and simply furnished underneath with a greater or smaller number of hairs; the first, as in several of the Cleri of Fabricius, is only visible underneath, where it forms a little projection; it is also pilose.

The remaining subgenera are *Thymalus*, *Ips*, *Cercus*, and *Byturus*.

Those that compose our sixth tribe, that of the Engidites, analogous to the Nitidulariæ in the emargination of the extremity of their mandibles, are distinguished from them by their not projecting, or but very little and simply on the sides, beyond the labrum. Their body is oval or elliptical, and the anterior extremity of the head slightly extended into an obtuse or truncated point. The tarsi consist of five distinct joints, entire, and at most, slightly pilose underneath; the penultimate is somewhat shorter than the preceding one. The antennæ terminate in a perfoliaceous triarticulated club; the elytra completely cover the abdomen, and the palpi are somewhat thicker at the extremity. Some very small species inhabit the interior of houses, and are frequently found on windows.

We will unite them all in a single genus, that of

Dacne.

Their antennæ terminate abruptly in a very large orbicular or ovoid and compressed club, composed of crowded joints, of which the middle one at least is much wider than it is long; the third is longer than the second and fourth.

We now come to certain tribes in which the præsternum is frequently dilated anteriorly in the manner of a chin-cloth, and which differ from the preceding ones in their feet, which are either wholly or partially contractile; the tarsi may be free, but the tibiæ at least can be flexed on the thigh. The mandibles are short, and generally thick and dentated. The body is ovoid, thick, and covered with deciduous scales or hairs of various colours. The antennæ are straight and usually shorter than the head and thorax. The head is plunged into the thorax as far as the eyes. The thorax is but slightly or not at all bordered, trapezoidal, and wider posteriorly; the middle of its posterior margin is frequently somewhat prolonged or lobate. The

larvæ are pilose, and mostly feed on the exuviæ or carcasses of animals. Several are very injurious to entomological collections.

Those then in which the legs are not completely retractile, the tarsi being always free, and the tibiæ elongated and narrow, form our seventh tribe, that of the DERMESTINI, and the great genus

DERMESTES.

In Dermestes, properly so called, the antennæ are similar, or differ but very slightly in both sexes; the length of the last joint is never much greater than that of the preceding ones.

Some of the species do great injury among furs, and devastate our collections of natural history. De Geer calls them *dissectors*, and in fact the *Dermestes lardarius* cuts to pieces the Insects of the cabinet into which it has penetrated. The others devour the dead bodies of all kinds of animals.

D. lardarius, Lat. Black; base of the elytra cinereous and dotted with black. The larvæ is elongated, insensibly tapered from head to tail, of a chestnut-brown above, white beneath, furnished with long hairs and two squamous horns on the last annulus.

There are various other Dermestini arranged in different genera, such as *Attagenus*, *Megatoma*, *Anthrenus*, &c.

The eighth tribe, that of the BYRRHII, differs from the preceding in the perfect contractility of the legs; the tibiæ are susceptible of being flexed on the thighs, and the tarsi on the tibiæ, so that when thus folded and pressed against the body, the animal seems to be inanimate and entirely destitute of feet. The tibiæ are usually broad and compressed. The body is short and convex.

This tribe is chiefly composed of the genus

BYRRHUS, *Linnæus*.

The mentum of the true Byrrhii is of an ordinary size and interlocked (at least partially) by the præsternum, whose anterior extremity is dilated.

In some, the antennæ enlarge insensibly, or terminate in an elongated club formed of from five to six joints.

B. pilula, L. From three to four lines in length; black beneath, blackish-bronze or soot-colour and silky above, with little black spots mingled with lighter ones arranged in lines.

All the Byrrhii remain on the ground in sandy localities.

It is impossible to describe the Clavicornes of our second section, although a very natural one, but by the reunion of several characters.

The body of these Insects is generally ovoid, and their head plunged to the eyes in a trapezoidal thorax, with a recurved lateral margin, and terminating posteriorly in acute angles; the præsternum is dilated anteriorly and the legs are imperfectly contractile. They are found in the water, under stones in the vicinity of shores, and frequently in the mud: some of them—*Dryops*—are allied to the Gyrini by the structure and shortness of their antennæ.

I will divide this section into two tribes. The Insects which compose the first, or the ACANTHOPODA, are remarkable for their flattened and tolerably wide tibiæ, armed anteriorly with spines: for their short quadriarticulated tarsi, the hooks of which are of the usual size; and for their depressed body. The præsternum is dilated. The antennæ are a little longer than the head, arcuated and formed of eleven joints, the last six constituting an almost cylindrical and slightly serrated club; the second is short and not dilated.

This tribe is composed of the single genus

HETEROCERUS, *Fabricius*,

These Insects are found in the sand or mud, along the borders of rivulets, marshes, &c., issuing from their holes when disturbed by the trampling of feet. The form of their tibiæ enables them to turn up the earth, and conceal themselves in it; their tarsi can be flexed upon the tibiæ. There also reside their larvæ, which were first discovered by M. Miger.

The second tribe, or that of the MACRODACTYLA, comprises Clavicornes with simple, narrow tibiæ and long tarsi, all—one genus excepted (*Georissus*), well distinguished from every other of the tribe, by its antennæ of nine joints, of which the three last form an almost solid club—composed of five distinct joints, the last of which is large, with two stout terminal hooks. The body is thick or convex. The thorax is less rounded, and most commonly terminates on both sides in acute angles.

The principal type of this tribe is the genus

DRYOPS, *Olivier*.

In Dryops proper, the antennæ, shorter than the head, are received into a cavity situated under the eyes, and are almost covered by the second joint, which is large, dilated, in the form of an almost triangular palette, and projects in the manner of an auricle, whence the name of *Dermeste à oreilles*, given to the most common species by Geoffroy. The palpi are not salient.

There are three subgenera: viz. *Elmis, Macronychus, Georissus.*

FAMILY V.

PALPICORNES*.

IN our fifth family of pentamerous Coleoptera, as in the fourth, we observe antennæ terminating in a club, usually perfoliaceous, but consisting of nine joints at most in all, and inserted under the lateral and projecting edges of the head; they are never much longer than the latter and the maxillary palpi, and frequently even shorter than the last mentioned organs. The mentum is large and scutiform.

* Palpi-horned.

The body is usually ovoid or hemispherical, convex or arched. The legs in several are adapted for swimming, and then consist of but four very distinct joints, or of five, the first of which is much shorter than the second; all the joints are entire.

Those in which the legs are natatory, have the first joint of the tarsi much shorter than the following ones, and the maxillæ are entirely corneous, these will form our first tribe, that of the HYDROPHILII, which embraces the genus

HYDROPHILUS, *Geoffroy.*

Linnæus merely made these Insects a division (the first) of his genus *Dytiscus*, but their anatomy is essentially different. In the true Hydrophilus the sternal spine is strongly prolonged behind. The last joint of the two anterior tarsi of the males is dilated in the form of a triangular palette. The scutellum is large.

The larvæ resemble a sort of soft, conical, and elongated worm, furnished with six feet, and a large squamous head, more convex underneath than above, armed with strong and hooked mandibles. They respire by the posterior extremity of the body, are very voracious, and do great injury to fish ponds by devouring the spawn.

H. piceus, Fab. An inch and a half long; oval; of a blackish-brown, polished, or as if covered with a varnish; antennal club partly reddish; some slightly marked striæ on the elytra, the posterior extremity of which is rounded laterally, and prolonged into a small tooth at the internal angle.

It swims and flies well, but walks badly. When held loosely in the hand, its sternal spine sometimes inflicts a wound.

The extremity of the female is provided with two fusi, by means of which she constructs an ovoid cocoon, surmounted with a point, resembling an arcuated brown horn. Its external tissue is a gummy paste, which, though fluid at first, subsequently hardens, and becomes impervious to water. The ova it contains are arranged symmetrically, and kept in situ by a sort of white down. These cocoons float on the water.

The larva is depressed, blackish and rugose, and has the faculty of throwing back its brown, smooth, round head. This enables it to capture the little Mollusca which navigate the surface of the water, its back serving as a point d'appui or anvil on which it mashes the shell in order to devour the animal it contains. The body of these larvæ becomes flabby as soon as they are caught. They swim with great facility, and are provided with two fleshy appendages which serve to maintain them on the surface of the water, head downwards, when they come there to respire. According to M. Miger, the larvæ of other Hydrophilii are deprived of these appendages, and neither swim nor suspend themselves like those of which we have been speaking. The females of these species swim with difficulty, and carry their ova under the abdomen enclosed in a silken web.

There are many other genera of Hydrophilians, such as *Hydrochus, Octhebius, Spercheus*, &c., differing in form, the arrangement of the antennæ, &c.

Our second tribe, or the SPHÆRIDIOTA, consists of terrestrial Palpicornes, with tarsi composed of five very distinct joints, the first of which is at least as long as the second. The maxillary palpi are somewhat shorter than the antennæ, with the third joint longer, inflated, and in the form of a reversed cone. The maxillary lobes are membranous.

The body is nearly hemispherical, the posterior extremity of the præsternum is prolonged into a point, and the tibiæ are spinous; those that are anterior are palmated or digitated in the large species. The antennæ always consist of nine joints, or of eight, if the last be considered as an appendage of the penultimate.

These Insects are small, and inhabit cow-dung and other manures; certain species are found near the shores of rivers, &c. They compose the genus

SPHÆRIDIUM, *Fabricius*,

From which, however, we must separate several species, a division already effected by Olivier. Dr. Leach only considers as such those in which the anterior tarsi of the males are dilated. Such is

S. 4-maculatum. Which is of a shining black and smooth; the scutellum is elongated, and the legs are very spinous; a blood-red spot at the base of each elytron, and their extremity reddish. In some individuals these spots diminish or disappear.

FAMILY VI.

LAMELLICORNES*.

IN our sixth and last family of pentamerous Coleoptera, we find the antennæ inserted into a deep fossula under the lateral margin of the head; they are always short, usually consist of nine or ten joints, and are always terminated in a club usually composed of the three last, which are lamellar, sometimes flabelliform or disposed like the leaves of a book, opening and closing in a similar way, sometimes concentrically contorted and fitting in each other, the first or inferior then being semi-infundibuliform and receiving the others, and sometimes arranged perpendicular to the axis and forming a sort of comb.

The body is generally ovoid or oval, and thick. The exterior side of the two anterior tibiæ is dentated, and the joints of the tarsi, with the exception of those of some males, are entire and without brush or pellet beneath.

The anterior extremity of the head most commonly projects or is dilated in the manner of an epistoma. The mentum is usually large, covers the ligula or is incorporated with it, and bears the palpi. The mandibles of several are membranous, a character observed in no other coleopterous Insects. The males frequently differ from the females, either by prominences on the thorax or head in the form of horns or tubercles, or by the largeness of their mandibles.

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* Horns foliated.

This family is very numerous, and with respect to the size of the body, the variety of forms exhibited in the head and thorax, sexually considered, is one of the most beautiful of the order, and frequently also as regards the species, which in their perfect state live upon vegetable substances, by the splendour of the metallic colours with which they are ornamented. Most of the other species, however, feeding on decomposed vegetable aliment, such as dung, tan, &c., are usually of one uniform black or brown hue. Some of the Coprophagi, however, do not yield even in this respect to the former. They are all furnished with wings, and their gait is heavy.

The body of the larvæ is long, almost semicylindrical, soft, frequently rugose, whitish, and divided into twelve annuli, with six squamous feet; the head is squamous and armed with stout mandibles. Each side of the body is furnished with nine stigmata; its posterior extremity is thicker, rounded, and almost always doubled under it, so that the back being arcuated or convex, the animal cannot extend itself in a straight line, crawls badly on a level surface, and falls backwards or on its side every instant. An idea of their form may be obtained from that of the larva, *Melolontha vulgaris**, so well known to gardeners.

Some of them require three or four years to become pupæ; they construct in their place of residence an ovoid shell, or one resembling an elongated ball, composed of earth or the remains of substances they have gnawed, the particles of which are cemented by a glutinous matter produced from their body. Their aliment consists of the dung of various animals, mould, tan, and roots of vegetables, (frequently such as are necessary to Man,) of which they sometimes destroy immense quantities, to the great loss of the cultivator of the soil.

We will divide this family into two tribes. In the first or that of the Scarabæides, we find the antennæ terminating in a foliaceous and generally plicatile club, and composed in others of joints that fit into each other, either in the form of a reversed cone or nearly globular. The mandibles are identical or almost similar in both sexes, but the head and thorax of the males exhibit peculiar projections or eminences; sometimes also their antennæ are more developed. This tribe corresponds with the genus

Scarabæus, *Linnæus.*

This genus is now divided into several small sections established on characters drawn from the organs of manducation, antennæ, and habits.

The Coprophagi or the Scarabæides of our first section, usually have their antennæ composed of nine joints, and of eight in the others, the three last forming the club.

Among the most interesting of the various genera which compose this section is the

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* Our common *grubs*, which are so abundant in dung-hills, gardens, &c., are larvæ of various species of Lamellicornes.

ATEUCHUS, *Fabricius.*

Two species of Ateuchus were worshipped by the ancient Egyptians, and formed a part of their system of hieroglyphics. They are sculptured in various positions, and sometimes of gigantic dimensions, on all their monuments. They were also figured separately and on the most precious materials, such as gold; they used them as seals and as amulets, which were suspended to the neck and buried with the mummies. The insect itself has been found in some of their coffins. The

A. sacer; which is found not only in all Egypt, but in the south of France, in Spain, Italy, and the south of Europe generally, has hitherto been considered the object of this superstitious distinction; but another species discovered in Sennaar by M. Caillaud of Nantes, appears from its more brilliant colours, and the country in which it is found, the original residence of the Egyptians, to have first attracted their attention.

The remaining genera are *Sisyphus, Coprobius, Oniticellus, Copris proper, Aphodius,* &c. &c.

The ARENICOLI, with the Aphodii and Psammodii, are the only ones whose elytra entirely cover the posterior extremity of the abdomen, so that the abdomen is completely concealed; but they are distinguished from the latter by several characters. The labrum is coriaceous, and most frequently juts out beyond the epistoma. The mandibles are corneous, and usually salient and arcuated. The terminal lobe of the maxillæ is straight, and has no inward curve. The third and last joint of the labial palpi is always very distinct, and at least almost as long as the preceding one. With some few exceptions, their antennæ are composed of ten or eleven joints.

These Insects make deep holes in the ground, fly particularly during the evening, after sun-set, and counterfeit death when seized.

The XYLOPHILI comprise the *Geotrupes* of Fabricius, and some of his *Cetoniæ*. Here the scutellum is always distinct, and the elytra do not cover the posterior extremity of the abdomen. The tarsial crotchets of several are unequal. The antennæ always consist of ten joints, the three last forming a foliaceous club, of which the intermediate leaflet is never completely concealed or encased by the two others. The labrum is not salient, and its anterior extremity at most is exposed. The mandibles are entirely corneous, and jut out beyond the sides of the head. The maxillæ are corneous or of a solid consistence, straight and commonly dentated. The ligula is covered by an ovoid or triangular mentum, narrowed and truncated at its extremity, the angles of which are frequently dilated. All the legs are inserted at an equal distance from each other. Here we find

SCARABÆUS proper,—GEOTRUPES, *Fabricius,*

The body of which are thick and convex, and the outer side of the mandibles sinuous or dentated. The equatorial countries of both hemispheres produce very remarkable species of this subgenus.

S. Hercules, Lin. Five inches long; black; elytra greenish-grey mottled with black: a recurved and dentated horn on the head of the male, and a second one, long, projecting and pilose beneath, with a tooth on each side of the thorax. South America. Some travellers call it the *Mouche cornue*.

This section also includes *Phileurus*, *Rutela*, *Oryctes*, &c. &c.

The Phyllophagi consist of Scarabæides whose mandibles are covered above by the epistoma, and concealed beneath by the maxillæ; their outer side is alone exposed, without however overlapping; their outer side presents none of the sinuses or dentations observed there in Rutela and other analogous subgenera. The anterior edge of the labrum is exposed; it is sometimes in the form of a reversed and wide triangle, and most frequently transversely laminiform, and emarginated in the middle. The number of the antennal joints is not constant, and varies from eight to ten; the same remark applies to those of the club, and in several, with respect to this, the two sexes differ greatly. The ligula is entirely covered by the mentum, or incorporated with its anterior face, and the elytra are completely joined along the whole of the suture, characters which distinguish these insects from those of the fifth section.

In the Anthobii the antennæ are composed of nine or ten joints, the three last of which alone form the club in both sexes. The lobe terminating the maxillæ is frequently almost membranous, silky, penicilliform, coriaceous, and dentated along the inner edge in others. The labrum and mandibles are more or less solid in proportion as they are more or less exposed. The Anthobii live on flowers or leaves.

Some of these Insects inhabit the north of Africa and other countries situated on the Mediterranean; most of the others are found in the higher portions of western Asia.

The genera that compose this section are *Glaphyrus*, *Amphicoma*, *Anthipna*, &c.

The sixth and last section of the Scarabæides, that of the Melitophili, is composed of insects in which the body is depressed, most commonly oval, briiliant, and without horns, and the thorax is trapeziform, or nearly orbicular; an axillary part, in the greater number, occupies the space comprised between the posterior angles and the exterior of the base of the elytra. The sternum is frequently extended into a point or projecting horn. The hooks of the tarsi are equal and simple. The antennæ consist of ten joints, the three last of which form a club, always foliaceous. The labrum and mandibles are concealed, laminiform, flattened, and membranous, or nearly so. The maxillæ terminate in a silky, penicilliform lobe without horny teeth. The mentum is commonly ovoid, truncated superiorly, or almost square, and the middle of the superior margin more or less concave or emarginate. The ligula is not salient.

The larvæ live in rotten wood. The perfect insect is found on flowers, and frequently on trunks of trees, that give out a fluid which they suck.

This section is susceptible of being separated into three principal divisions, the first of which corresponds to the genus *Trichius*, Fab.; the second to that of *Goliath*, Lam.; and the third to *Cetonia*, Fab., but reduced and simplified.

In the first—*Trichides*—the mentum is either isometrical, or longer than wide, and leaves the maxillæ exposed. It comprises the

TRICHIUS, *Fabricius.*

T. nobilis. About an inch long; golden-green above; cupreous with yellowish-grey hairs beneath. On umbelliferous plants.

The female of the *T. hemipterus* and those of some other species of North America are remarkable for the horny ovipositor at the posterior extremity of their abdomen, by which they effect a lodgement for their ova.

These species are generally found on the ground, where they move very slowly. There are two other genera, *Platygenia* and *Cremastocheilus.*

The second division, *Goliathides*, is distinguished from the preceding by the mentum, which is much longer, wider, and covers the maxillæ.

GOLIATH, *Lambert, Kirk.*—CETONIA, *Fabricius, Olivier.*

A subgenus which, according to M. de Lamarck, is composed of large and beautiful species, some of which inhabit Africa and the East Indies, and the others tropical America. Messrs. Lepeletier and Serville have separated the latter from it under the generic appellation of INCA. The epimera is not prominent. The inner sides of the thighs of the two anterior legs are furnished at base with a tooth and an emargination. The middle of the superior margin of the mentum is strongly emarginated; this part in the true Goliaths presents four lobes or teeth, two superior and the two others lateral. The labial palpi are inserted on its edges in the emarginations of these latter lobes. All the known species are large.

In the third division of the Melitophili, a section corresponding to the family of the *Cetoniidæ*, Mac Leay, the sternum is prolonged more or less into an obtuse point between the second pair of legs; the epimera or axillary piece is always apparent above, and occupies all the space that separates the posterior angles of the thorax from the base of the elytra; the thorax usually becomes widened posteriorly, and has the form of a triangle truncated anteriorly or at the point. The mentum is never transversal, and its superior edge is more or less emarginated in the middle. The terminal lobe of the maxillæ is silky or penicilliform. The body is almost ovoid, and depressed.

This division comprises the genus

CETONIA, *Fabricius,*

Or what we commonly term *Goldbeaters.* Those of Europe are provided with a scutellum of an ordinary size. Such are the

C. aurata. Nine lines in length; brilliant golden-green above; cupreous-red beneath; white spots on the elytra. Common on flowers, and frequently on those of the Rose and Elder.

In the second tribe of the Lamellicornes or the LUCANIDES, so called from the genus *Lucanus* of Linnæus, the antennal club is composed of leaflets or teeth arranged perpendicularly to its axis in the manner of a comb. These

organs always consist of ten joints, the first of which is usually much the longest. The mandibles are always corneous, most commonly salient and larger, and even very different in the males. The maxillæ, in most of them, are terminated by a narrow, elongated and silky lobe; those of others are entirely corneous and dentated. The ligula in the greater number is formed of two small silky pencils, projecting more or less beyond an almost semi-circular or square mentum. The anterior legs are most frequently elongated, and their tibiæ dentated along the whole of the outer side. The tarsi terminate by two equal and simple hooks with a little appendage terminated by two setæ between them. The elytra covers the whole of the abdomen above.

We will divide it into two sections, corresponding to the genera *Lucanus* and *Passalus* of Olivier.

In the first we find the antennæ strongly geniculate, glabrous or but slightly pilose; the labrum very small or confounded with the epistoma; maxillæ terminated by a membranous or coriaceous, very silky, penicilliform lobe; without teeth, or at most with but one; and a ligula either entirely concealed or incorporated with the mentum, or divided into two narrow, elongated, silky lobes extending more or less beyond the mentum. The scutellum is situated between the elytra.

The first section will form the genus

Lucanus.

The larva of the *L. cervus*, which inhabits the interior of the oak for several years previous to its final metamorphosis, is considered as the *Cossus* of the Romans, or that verminiform animal which they regarded as a delicious article of food.

L. cervus, L. (The Stag Beetle.) The male two inches in length, and larger than the female; black, with brown elytra; head wider than the body; mandibles very large, arcuated, with three very stout teeth; two of which are at the end and diverge, the other is in the inner side, all furnished with small ones. The female, called *Doe*, has a narrower head and much smaller mandibles. It flies at night in the heat of summer. Its size and mandibles vary. It is to one of these varieties that we must refer the *Lucane chèvre* of Olivier, or the *L. capreolus* of Fabricius. The Lucanus, so called by Linnæus, is a species from North America, and very distinct from the preceding.

The subgenera are *Sinodendron*, *Æsalus*, *Lamprima*, &c.

The Lucanides of our second section have their antennæ simply arcuated, or but slightly geniculate and pilose; the labrum always exposed, crustaceous, and transversal; the mandibles strong and much dentated, but without any very remarkable sexual difference; the maxillæ entirely corneous, with at least two strong teeth; the ligula equally corneous or very hard, situated in a superior emargination of the mentum, and terminated by three points; the abdomen pediculated, presenting the scutellum above, and separated from the thorax by a strangulation of considerable interval. They form the genus

PASSALUS, *Fabricius*,

Restricted by M. Mac Leay to those species in which the club of the antennæ consists of but three joints, where the labrum forms a transversal square, and the maxillæ have three strong terminal teeth, and two on the inner side in place of the anterior lobe.

These insects are foreign to Europe, and, as it would appear, to Africa, being chiefly found in the eastern parts of Asia, and particularly in America. Madame Merian says, that the larva of the species figured by her lives on the roots of the sweet potato. The perfect insect is not uncommon in the sugar-houses.

In the second general section of the Coleoptera, or the HETEROMERA, we find *five joints in the four first tarsi, and one less in the two last.* They all feed on vegetable matters.

In some, where the elytra are generally solid and hard, and the hooks of the tarsi are almost always simple, the head is ovoid or oval, susceptible of being received posteriorly into the thorax, or sometimes narrowed behind, but not abruptly, and without a neck at its base. Many of these Heteromera avoid the light. This division will comprise the three following families.

FAMILY I.

MELASOMA.

THIS family consists of unmixed black or cinereous coloured insects (from which is derived the name of the division), mostly apterous, and frequently with soldered elytra. Their antennæ, entirely or partly granose, almost of equal distance throughout or slightly inflated at the extremity, and the third joint wholly elongated, are inserted under the projecting edges of the head. The mandibles are bifid or emarginated at the extremity; the inner side of their maxillæ is furnished with a corneous tooth or hook, all the joints of the tarsi are entire, and the eyes oblong and but very slightly prominent, a circumstance which, according to M. Marcel de Serres, indicates their nocturnal habits. Almost all these insects live on the ground, either in sand, or under stones, and frequently in cellars, stables, and other dark places about our habitations.

Our first division of this family, which in the Linnæan system forms the genus TENEBRIO, is founded on the presence or absence of wings.

Of those which are deprived of these organs, and in which the elytra are generally soldered, some have the palpi almost filiform, or terminated by a moderately dilated joint, and do not form a distinctly securiform or triangular club. They will compose a first tribe, that of the PIMELIARIÆ, so named from the genus

PIMELIA, *Fabricius.*

These Heteromera are proper to the countries situated round the basin of the Mediterranean, to western and southern Asia, and to Africa. They are not found in India, or at least none have as yet been discovered there.

The Pimeliariæ consist of numerous genera, the chief of which are, *Erodius, Zophosis, Tentyria, Aris, Tagenia,* &c.

The second tribe of the Melasoma, that of the BLAPSIDES, receives its denomination from the genus BLAPS of Fabricius.

The maxillary palpi terminate by a manifestly securiform or triangular joint. This tribe is formed of a single genus, that of

BLAPS.

In Blaps properly so called, the thorax is almost square and plane, or but slightly convex. The abdomen is oval, truncated transversely at base, and more or less elongated. The elytra of most of them are narrowed and prolonged into a point, those of the males especially. The third joint of the antennæ is cylindrical and much longer than the following ones; the latter, or at least the three antepenultimate ones, are granose; the last is ovoid and short.

B. lævigata, Fab. This species might constitute a particular subgenus. Its body is much shorter than that of the others, and extremely convex or gibbous. The antennæ are granose from the fourth joint. The anterior tibiæ terminate in a stout point or spine formed by a spur.

It is stated by Fabricius that the Turkish women inhabiting Egypt, where the insect is very common, eat the *Blaps sulcata,* cooked with butter, in order to become fat. The same author also says that it is used as a remedy for the headach and the sting of a scorpion.

The remaining Blapsides are distributed under various genera, such as *Gonopus, Asida, Pedinus, Blaptinus,* &c.

We now come to Melasoma, provided with wings. Their body is usually oval or oblong, depressed or but slightly elevated; their thorax square or trapezoidal, and its posterior extremity as wide as the abdomen. The palpi are larger at the extremity; the last joint of the maxillary palpi has the figure of a reversed triangle, or is securiform; the mentum is but slightly extended in width, and leaves the base of the maxillæ exposed.

These insects compose the third and last tribe of the Melasoma, that of the TENEBRIONITES, formed of the single genus

TENEBRIO,

As originally arranged by Fabricius, and to which we will annex his *Opatrum* and *Orthocera;* they will serve as types of as many particular divisions.

1. Those in which the body is oval; the thorax nearly trapezoidal, arcuated laterally, or forming a semioval, truncated anteriorly, wider than the abdomen,

at least at its posterior margin, but slightly or not at all bordered; in which the maxillary palpi terminate by a securiform joint or one of an analogous figure, and where the antennæ insensibly enlarge.

Here we have *Crypticus*, Latreille; and *Opatrum*, Fabricius.

2. Those in which the body is narrow and elongated, almost of the same width posteriorly or wider; where the thorax is nearly square, and at least almost as broad as it is long, and where the antennæ form a thick club, or are abruptly dilated at the extremity.

To this division belong *Corticus*, *Orthocerus*, *Toxicum*, &c.

3. Those in which the body is equally narrow and elongated, and the thorax almost square, but where the antennæ are of the ordinary thickness, and are not abruptly terminated by a club.

The two anterior thighs are stout, and the tibiæ narrow and curved, or arcuated.

The genera are *Calcar*, *Upis*, *Tenebrio proper*, and *Heterotarsus*. The Tenebrionites are very common under bark of trees, on old walls, and the uninhabited parts of houses.

FAMILY II.

TAXICORNES.

In this second family of the heteromerous Coleoptera, we find no small corneous tooth on the inner side of the maxillæ. All these insects are winged, their body is most commonly square, their thorax trapezoidal or semicircular, and concealing or receiving the head. The antennæ, usually inserted under a marginal projection of the sides of the head, are short, more or less perfoliate or granose, enlarge insensibly, or terminate in a club. The legs are only adapted for walking, and all the joints of the tarsi are entire, and terminated by single hooks; the anterior tibiæ are frequently broad and triangular. Several males have the head furnished with horns. Most of them inhabit the fungi on trees, or under the bark; some live on the ground, under stones.

In some, the head is completely exposed, and never entirely received into a deep notch in the anterior of the thorax. This last is sometimes trapezoidal or square, and at others almost cylindrical; its sides, as well as those of the elytra, do not extend remarkably beyond the body.

This division will form the tribe of the Diaperiales, the type of which is the genus

Diaperis.

In Diaperis properly so called, the maxillary palpi terminate in an almost cylindrical joint, hardly thicker than the penultimate; and the anterior tibiæ, hardly or not at all wider than the following ones, are narrow, almost linear, and slightly dilated at the extremity.

The remaining genera of this tribe are *Phaleria*, *Hypophlæus*, *Tetratoma*, *Eledona*, &c.

Our second tribe of the Taxicornes, the Cossyphenes, consists of insects analogous in form to the *Peltis* of Fabricius, and to several Nitidulæ and Cassidæ: it is ovoid or sub-hemispherical, and overlapped in its contour by the dilated or flattened sides of the thorax and elytra; the head is sometimes wholly concealed under the thorax, and at others received into an anterior emargination of the same part. The last joint of the maxillary palpi is larger than the preceding ones, and securiform.

This tribe is composed of the genus

Cossyphus, *Olivier, Fabricius,*

Some of which have a flat body, of a solid consistence, in the form of a shield, and antennæ terminated by a club composed of four or five joints; they are peculiar to the eastern Continent and to New Holland. Such are those which form the

Cossyphus, *Olivier, Fabricius,*

Or Cossyphus properly so called, where the almost semicircular thorax presents no anterior emargination, and entirely conceals the head; where the antennæ are short, and terminate abruptly in an oval mass of four joints, most of which are transversal; the second of the whole number and the following ones are almost identical.

These insects inhabit the East Indies, southern part of Europe, and north of Africa.

FAMILY III.

STENELYTRA *,

The third family of heteromerous Coleoptera only differs from the second in the antennæ, which are neither granose nor perfoliate, and whose extremity, in the greater number, is not thickened. The body is most frequently oblong, and arcuated above, and the legs are elongated as in many other insects. With the exception of their antennæ and size, the males resemble the females. These Heteromera are usually much more agile than the preceding ones; several conceal themselves under the bark of old trees, while most of the others are found on leaves and flowers.

In some, the antennæ are approximated to the eyes, and the head is not prolonged in the manner of a proboscis, but terminated at most by a very short snout. They will form our four first tribes.

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* Compressed wing cases.

Those of the first or the HELOPII, have their antennæ covered at base by the margin of the head; they are generally filiform or slightly thickened towards the extremity, generally composed of almost cylindrical joints attenuated at base, of which the penultimate ones are frequently a little shorter, and in the form of a reversed cone, and the last is usually almost ovoid; the third is always elongated. The extremity of the mandibles is bifid; the last joint of the maxillary palpi is larger and securiform, or in the figure of a reversed triangle; the eyes are oblong, and reniform or emarginated. None of the legs are fitted for leaping; the penultimate joint of the tarsi, or at least of the last ones, is almost always entire or not deeply emarginate; their terminal hooks are simple or without fissure or dentation; the body is most commonly arcuated above, and always solid and firm.

Such of the larvæ as are known to us are smooth, filiform, and glossy, with very short legs, like that of a Tenebrio. They are found in old wood, and the perfect insect lives under the bark of trees.

This tribe mostly corresponds to the genus

HELOPS, *Fabricius.*

In the Helops, properly so styled, most of the joints of the antennæ are almost obconical or cylindrical, and attenuated at base. The thorax is tranversal, or hardly as long as it is wide, either square, trapezoidal, or cordiform, abruptly narrowed posteriorly, terminated by pointed angles, and always exactly applied to the base of the elytra.

The remaining genera of this tribe are *Epitragus, Cnodalon, Campsia,* &c.

The second tribe, that of the CISTELIDES, is very closely allied indeed to the first, but the insertion of the antennæ is not covered, the mandibles terminate in an entire or unemarginate point, and the hooks of the tarsi are pectinated inferiorly. Several of these insects live on flowers. This tribe forms the genus

CISTELA, *Fabricius.*

In Cistela, properly so called, the head projects in the manner of a snout, and the labrum is hardly wider than it is long; most of the joints of the antennæ are either obconical, triangular, or even serrated; the last is always oblong. The body is ovoid or bordering on an oval.

The other genera are *Lystronichus, Mycetophagus,* and *Allecula.*

The third tribe, that of the SERROPALPIDES, is remarkable, as intimated by its name, for the maxillary palpi, which are frequently serrated, very large, and inclined. The antennæ are inserted in an emargination of the eyes, exposed, as in the preceding tribe, and most usually short and filiform. The mandibles are emarginated or bifid at the extremity, and the hooks of the tarsi are simple. The body is almost cylindrical in some, and oval in others; the head is inclined, and the thorax trapezoidal. The anterior extremity of the head does not project, and the posterior thighs not inflated, characters which distinguish these insects from various Heteromera of the ensuing tribe. The

penultimate joint of the tarsi, or at least of the four anterior ones, is most commonly bilobate, and in those where it is entire, the posterior legs at least are fitted for leaping; in this case they are long and compressed, the tarsi small, almost setaceous, and their first joint elongated: the anterior ones are frequently short and dilated.

The type of this tribe is the genus

Dircæa, *Fabricius.*

In Dircæa, properly so called, the maxillary palpi are not serrated, and their last joint projects more on the inner side than the preceding ones. The thorax is insensibly lowered on the side. The scutellum is very small.

Here we have *Orchesia, Hallomenus, Melandrya, Hypulus*, &c.

The fourth tribe, that of the Œdemerites, is connected with the third by several characters, such as having the antennæ inserted near the eyes, and their origin exposed, the mandibles bifid at the end, the penultimate joint of the tarsi bilobate, and the maxillary palpi terminated by a larger and securiform joint; but if we except the Nothi, approximated by the form and breadth of the thorax, and by some other characters, to certain Heteromera of the preceding tribe, and yet distinguished from them by their strongly inflated posterior thighs, and their bicleft tarsial hooks, the Œdemerites present a union of characters which will not allow us to confound them with the other Heteromera. The body is elongated, narrow, almost linear, and the head and thorax are somewhat narrower than the abdomen. The antennæ are longer than the two latter, serrated in some—*Calopus*—filiform or setaceous, and composed of long and almost cylindrical joints in the others; the anterior extremity of the head is more or less prolonged into a little snout, and somewhat narrowed behind; the eyes are proportionally more elevated than in the preceding Heteromera. The thorax is at least as long as it is broad, almost square, or nearly cylindrical, and slightly narrowed behind; the elytra are linear or subulate posteriorly, and frequently flexible. These insects are found on flowers or trees. Their metamorphoses are unknown.

These Heteromera will be comprised in a single genus, the

Œdemera, *Olivier,*

Where the posterior thighs are strongly inflated in one of the sexes, where the antennæ are usually long and smaller at the extremity, and the elytra suddenly narrowed near the end.

There are several subgenera.

The fifth and last tribe of the Stenelytra, that of the Rhynchostoma, is composed of insects, some of which, such as the first, are evidently related by the ensemble of their characters to the Œdemeræ, while the others, in a natural order, appear to belong to the family of the Rhynchophora. The head is considerably prolonged anteriorly in the form of an elongated snout or flattened proboscis, bearing the antennæ at its base and before the eyes,

which are always entire or unemarginate. These insects form a single genus, that of

Mycterus.

In Mycterus, properly so called, the body is ovoid, solid, covered by a silky down, and the thorax trapeziform. The abdomen is square, long, rounded posteriorly; the antennæ are composed of joints, mostly obconical, the complete number of which seems to be twelve, the eleventh or last being abruptly narrowed and acuminated, and the maxillary palpi are terminated by a larger joint in the form of a reversed triangle.

The subgenera are *Stenostoma* and *Rhinosimus*.

FAMILY IV.

TRACHELIDES.

In our second general division and fourth family of heteromerous Coleoptera, the head is triangular or cordiform, and borne on a sort of neck or pedicle, abruptly formed, beyond which, being as wide at this point as the thorax, or wider, it cannot enter the cavity of the latter. The body is most commonly soft, the elytra are flexible, without striæ, sometimes very short, and a little inclined in others. The maxillæ are never unguiculated. The joints of the tarsi are frequently entire, and the hooks of the last bifid.

Most of the perfect insects live on different plants, devour their leaves, or suck the nectar of their flowers. Many, when seized, curve their head and fold up their feet as if they were dead; the others are very active.

We will divide this family into six tribes, forming as many genera.

In the first, or that of the Lagriarlæ, the body is elongated and narrower before; the thorax either almost cylindrical or square, or ovoid and truncated; the antennæ, inserted near an emargination of the eyes, are simple, filiform, or insensibly enlarged towards the end, most frequently and at least partially granose, the last joint being longer than the preceding ones in the males; the palpi are thicker at the extremity.

The species indigenous to France are found in woods, on various plants; their body is soft, their elytra are flexible, and like the Meloes, the Cantharides. when taken, counterfeit death.

This tribe is formed of the genus

Lagria, *Fabricius.*

Those species, in which the antennæ gradually enlarge, and are either wholly or partly almost granose, with the last joint ovoid or oval; in which the head projects but little before, and is prolonged and insensibly rounded behind; and where the thorax is almost cylindrical or square, compose the genus Lagria, properly so called.

The second tribe, that of the PYROCHROIDES, approaches the first in the tarsi and the anterior elongation and narrowing of the body, but it is flattened, and the thorax is almost orbicular or trapezoidal. The antennæ, at least in the males, are pectinated or plumous; the maxillary palpi are slightly serrated, and terminated by an elongated and almost securiform joint; the labial palpi are filiform; the abdomen is elongated, entirely covered by the elytra, and rounded at the extremity.

These Heteromera, which are found in the spring in woods, and whose larvæ live under the bark of trees, form the genus

PYROCHROA, *Geoffroy.*

In Pyrochroa, properly so called, the antennæ are simply pectinated and shorter, the eyes are remote from each other, and the thorax is almost orbicular and transversal.

In the third tribe, that of the MORDELLONÆ, so far as respects the form of the joints of the tarsi and of their hooks, and of that of the antennæ and palpi, we find no common and constant character. These insects, however, are easily distinguished from other Heteromera of the same family, by the general conformation of their body, which is elevated and arcuated; the head is low, the thorax trapezoidal or semicircular, and the elytra are very short or narrowed, and terminate in a point, like the abdomen. They form the genus

MORDELLA, *Linnæus.*

In Mordella properly so called, the antennæ are of equal thickness throughout, and somewhat serrated in the males; all the joints of the tarsi are entire, and the hooks of the last present one or two indentations beneath. The eyes are not emarginate.

M. Leon Dufour observed in the *Mordelle à bandes*, two floating salivary vessels longer than the body. The hepatic vessels have no cœcal insertion, an exceptive character in this section of the family.

The subgenera are *Ripiphorus*, *Myodites*, *Pelocotama*, and *Anaspis*.

In the fourth tribe, that of the ANTHICIDES, we find the antennæ simple or slightly serrate, filiform, or a little thicker towards the extremity, most of the joints being nearly obconical and almost similar, with the exception of the last, which is somewhat larger and oval. The thorax is sometimes obovoid, narrowed, and truncated posteriorly, sometimes divided into two knots, and at others semicircular. Some of these insects are found on various plants, but the greater number live on the ground. They run with great quickness. Their larvæ are perhaps parasitical.

They will compose the genus

NOTOXUS, *Geoffroy.*

In Notoxus properly so called, the antennæ enlarge insensibly, and are almost entirely composed of obconical joints, and the thorax is obovoid, narrowed and truncated posteriorly, or divided into two globular points.

The two last tribes of this family and of the section of the Heteromera present certain common characters, such as mandibles terminating in a simple point, &c. In a perfect state they are all herbivorous, but several, in their first state, or that of larvæ, are parasitical.

The *Horiales*, composing the fifth tribe, differ from those which constitute the sixth, or the *Cantharidiæ*, in their hooks, which are indented and accompanied (each) by a serrated appendage. These insects have filiform antennæ, as long, at most, as the thorax, a small labrum, strong and salient mandibles, filiform palpi, square thorax, and very robust posterior legs, at least in one of the sexes.

This tribe is composed of the genus

Horia, *Fabricius.*

These insects inhabit the intra-tropical countries of South America and of the East Indies. One of these insects is distinguished from all others by its head, which is narrower than the thorax, and by its posterior thighs, which are strongly inflated; a character, however, which in all probability belongs to only one of the sexes.

The sixth and last tribe, that of the Cantharidæ, is distinguished from the preceding one by the hooks of the tarsi, which are deeply cleft, and seem to be double. The head is usually large, wider, and rounded posteriorly. The thorax is commonly narrowed behind, and approaches the form of a truncated heart; in others it is almost orbicular. The elytra are frequently somewhat inclined laterally, or tectiform, flattened, and rounded. These insects simulate death when they are seized, and several, thus situated, produce a caustic yellowish liquid of a penetrating odour, from the articulations of their feet; the organs which secrete it have not yet been detected.

Various species—*Meloes, Mylabres, Cantharides*—are employed externally as epispastics. This tribe is formed of the genus

Meloe, *Linnæus,*

Which has been divided into several others.

In Meloe properly so called, the antennæ are composed of short and rounded joints, the intermediate of which are the largest, and sometimes so disposed, that these organs present in this point, in several males, an emargination or crescent. The wings are wanting, and the elytra, oval or triangular, with a portion of the inner margin crossing each other, only partially cover the abdomen, particularly in the females, where it is extremely voluminous.

They crawl along the ground, or upon low plants on the leaves of which they feed. A yellowish or reddish oleaginous liquid exudes from the articulations of their legs.

In some districts of Spain, these insects are used in place of Cantharides, or are mixed with them. They are also employed by the farriers. They were formerly regarded as a specific in hydrophobia. I suspect that our Meloes are the *Buprestes* of the ancients, insects to which they attributed very noxious

qualities, and which, according to them, killed the oxen that accidentally swallowed them while grazing.

Among the divisions of this genus the most noted is the

CANTHARIS, *Geoffroy, Olivier*,—MELOE, *Linnæus*,—LYTTA, *Fabricius*,

Which have all the joints of the tarsi entire, and the thorax almost ovoid, slightly elongated, narrowed anteriorly and truncated posteriorly, by which this subgenus is distinguished from the preceding one. The head is a little wider than the thorax. The antennæ of the males are sometimes irregular and even semipectinated.

C. vesicatorius. (The Spanish Fly.) From six to ten lines in length, of a glossy golden-green, with simple, regular, black antennæ. This insect is well known from its medical uses.

It appears in France, near the time of the summer solstice, and is more particularly found about the ash and lilac, on the leaves of which it feeds; it diffuses a highly penetrating odour. The larva lives in the ground and gnaws the roots of plants. In the United States of America, the species called by Fabricius the *vittata* (our *Potato-fly*), and which abounds on the potato plants, is applied to the same uses as the one of which we are speaking.

The third general section of the Coleoptera, that of the TETRAMERA, consists exclusively of those in which all the tarsi are quadriarticulated.

All these insects live on vegetable matters. The feet of their larvæ are usually very short, and they are even wanting or are replaced by mammillæ in a great number. The perfect insect is found on the flowers or leaves of plants.

FAMILY I.

RHYNCHOPHORA*.

THIS family is distinguished by the entire prolongation of the head, which forms a sort of snout or proboscis.

The abdomen is bulky in most of them, the antennæ geniculate, and frequently clavate. The penultimate joint of the tarsi is almost always bilobate. The posterior thighs are dentated in several.

The larvæ have an oblong body, and resemble a small, very soft, white worm; their head is squamous, and they are destitute of feet, or in lieu of them there are merely small mammillæ. They gnaw various parts of plants. Several live exclusively in the interior of their fruit or seeds, and frequently do us much injury. Their chrysalides are enclosed in a shell. Many of the Rhynchophora, when very abundant within certain limits, are even very noxious in their perfect state. They tap the buds or leaves of various cultivated vegetables, useful or necessary to man, and feed on their parenchyma.

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* Long-snouted.

BRUCHUS, *Linnæus.*

In Bruchus proper, the antennæ are filiform and frequently serrated or pectinated; the eyes are emarginated. The posterior legs are usually very large.

The females deposit an egg in the yet diminutive and tender germ of various leguminous cerealia, of the coffee-tree, palms, &c., where the larva lives and is metamorphosed. To obtain an issue the perfect insect detaches a portion of the epidermis in the form of a cap, thus producing those holes but too often found in peas, beans, dates, &c. The perfect insect is taken on flowers.

The labrum is apparent, the anterior elongation of their head short, broad, depressed, and in the form of a snout; the palpi are very visible and filiform, or larger at the extremity.

B. pisi, Lin. Length two lines; black; base of the antennæ and part of the legs fulvous; elytra dotted with grey. A very noxious little insect, that in certain seasons has occasioned much damage in North America.

Those, in which the three or four last joints are united into a club, form the genus

ATTELABUS, *Linnæus.*

They attack the leaves or most tender parts of plants. Most of the females roll up these leaves into a tube or cornet, in which they deposit their eggs, thus preparing a domicil for their young ones, which also furnishes them with food.

Those in which the antennæ are filiform, or where the last joint alone forms the club; where the proboscis, frequently longer in the males than in the females, and often differently terminated, always projects forwards; in which all the other parts of the body are usually much elongated, and the penultimate joint of the tarsi is bilobate, form the genus

BRENTUS.

These insects are peculiar to hot climates. Their body is linear, and the antennæ, filiform or slightly enlarged towards the extremity, are composed of eleven joints.

Sometimes the antennæ are distinctly geniculate, the first joint being much longer than the following ones. They form the genus *Curculio* of Linnæus.

We will divide them into the *Brevirostres* and the *Longirostres*, according as the antennæ are inserted near the extremity of the proboscis, and even with the origin of the mandibles, or further back, either near its middle or close to its base.

The Brevirostres of this naturalist, according to the system of Fabricius, are divided into two genera.

BRACHYCERUS,

Where all the joints of the tarsi are entire and without brush or pellet beneath. Their short and but slightly geniculate antennæ present externally but nine joints, the last of which forms the club. They are destitute of wings, and

their body is very scabrous or uneven. These Insects are peculiar to the south of Europe and to Africa, live on the ground and appear very early in the spring. The women of Ethiopia use one species as a sort of amulet; they pass a string through its body and hang it round their neck.

Curculio.

Where almost the whole under part of the tarsi is furnished with short and stiff hairs, forming pellets, and their penultimate joint is deeply bilobate. Their antennæ are composed of eleven joints, or even of twelve if we count the false one, which sometimes terminates them, the last of which forms the club.

As this genus, although much more restricted than in the Linnæan system, still comprises numerous species discovered since the time of that naturalist, various savans, Germar and Schœnherr in particular, have divided it into many others.

C. imperialis, Fab. (The Diamond-Beetle.) A brilliant golden-green, with two black and longitudinal bands on the thorax; ranges of golden-green impressed points on the elytra, with black intervals.

The Longirostres, or those whose antennæ are inserted beyond the origin of the mandibles, and frequently near the middle of the proboscis, which is usually long, comprise, with some exceptions, the genera *Lixus, Rhynchænus,* and *Calandra* of Fabricius.

In the two first the antennæ present ten joints at least, but most commonly eleven or twelve, of which the three last at least form the club.

Lixus, *Fabricius.*

The Lixi almost resemble the Cleoni in their organs of manducation, as well as in the elongated fusiform club of their antennæ, the narrow and elongated figure of their body, and the armature of their tibiæ.

Rhynchænus, *Fabricius.*

The Rhynchæni present no such ensemble of characters.

Sometimes the legs are contiguous at base, and there is no sternal fossula for the reception of the proboscis.

Some never leap, and their antennæ are composed of eleven or twelve joints. The subgenera are numerous.

The remaining Longirostres have generally nine joints at most in the antennæ, and the last, or two last at most, form a club with a coriaceous epidermis and spongy extremity. They feed, at least while in the state of larvæ, on seeds or ligneous substances.

They may be united in the single genus

Calandra.

In Calandra properly so called, the antennæ are strongly geniculate, but inserted near the base of the proboscis; their eighth joint forms an ovoid or triangular club.

C. granaria. But too well known; its body is elongated and brown; tho-

rax as long as the elytra and punctured. Its larva, known by the name of weevil (*genre*), is the destroyer of our granaries.

C. oryzæ. Similar to the preceding, but with two fulvous spots on each elytron. It attacks rice.

C. palmarum. Length an inch and a half; club of the antennæ truncated; entirely black, with silky hairs at the extremity of the proboscis. It lives on the pith of the palms of South America. The inhabitants of that country consider its larva, called the *verpalmiste*, as a great delicacy.

There are several subgenera.

FAMILY II.

XYLOPHAGI*.

In our second family of tetramerous Coleoptera, we find the head terminating as usual, without any remarkable projection, in the form of a proboscis or snout. The antennæ are thicker near the extremity, or perfoliate at base, always short, and consist of less than eleven joints in a great number. The joints of the tarsi are usually entire, the penultimate being sometimes widened, and cordiform in others; in this case the antennæ always terminate in a club, either solid and ovoid, or trifoliate, and the palpi are small and conical.

These insects mostly live in wood which is perforated and channelled in various directions by their larvæ. When they happen to abound in forests, those of pines and firs particularly, they destroy in a few years immense numbers of trees, which are rendered useless for any purpose of art. Others do great injury to the olive, and some again feed on mushrooms.

We will divide this family into three sections.

1. Those in which the antennæ are composed of ten joints at most, sometimes terminating in a stout club, most commonly solid, and sometimes consisting of three elongated leaflets; and at others forming a cylindrical and perfoliate club from their base, and in which the palpi are conical. The anterior legs of the greater number are dentated and armed with a stout hook, and the tarsi, of which the penultimate joint is frequently cordiform or bilobate, are susceptible of being flexed on them.

Some have very small palpi, the body convex and rounded above, or almost ovoid, the head globular and plunged into the thorax, and the antennæ solid or trilamellate, and preceded by five joints at least.

These Xylophagi form the genus

Scolytus, *Geoffroy.*

In Scolytus properly so called, the antennæ are straight, beardless, and inserted close to the inner margin of the eyes, which are narrow, elongated, and vertical.

* Wood-eaters.

The others have large and very apparent palpi of unequal lengths. Their body is depressed and narrowed before; their antennæ sometimes consist of two joints, the last of which is very large, flattened, and almost triangular, or nearly ovoid, and sometimes of ten, and are entirely perfoliate.

The labium is large; the elytra are truncated, and tarsi short, with all the joints entire. These insects are all foreign to Europe, and compose the genus

Paussus, *Linnæus*,

Where the antennæ consist of but two joints, with the last large and compressed.

2. A second section will comprise those Xylophagi whose antennæ consist of but ten joints, and in which the palpi, at least those of the maxillæ, do not gradually taper to a point, but are of equal thickness throughout, or dilated at the extremity. The joints of their tarsi are always entire.

We will divide them into principal genera, according to the mode in which the antennæ terminate. The three last joints form a perfoliate club in the first, or

Bostrichus.

In Bostrichus proper, the body is more or less cylindrical, the head rounded, almost globular, and capable of being received into the thorax as far as the eyes; the thorax is more or less convex before, and forms a sort of hood; the two first joints of the tarsi, as well as the last, are elongated.

B. capucinus. Five lines in length, with a red abdomen and elytra of the same colour. Very common in old wood in timber yards.

The second genus of this division, or

Monotama,

Is distinguished from the first by the solid and globuliform club—the tenth joint—of the antennæ.

The body is elongated, depressed, and frequently forms a parallelopiped; the anterior part of the head is narrowed, and projects somewhat in the manner of a triangular and obtuse snout. The palpi are very small, and, as well as the mandibles, not salient.

3. The Xylophagi of the third division have eleven very distinct joints in the antennæ; their palpi are filiform, or thicker at the extremity in some, and smaller in others; all the joints of the tarsi are entire.

Those in which the club of the antennæ consists of but two joints form the genus

Lyctus.

In Lyctus proper the margin of the head covers the whole or greater part of the first joint of the antennæ. The mandibles are not salient.

In the other Xylophagi with antennæ composed of eleven joints, the three or four last form the club, or the last is alone larger than the preceding ones. They are subdivided thus:

Sometimes the mandibles are covered or project but little, as in

MYCETOPHAGUS, *Fabricius.*

In Mycetophagus proper, the club of the antennæ commences at the sixth or seventh joint; the last is almost ovoid.

There are several subgenera, such as *Triphyllus, Dasycerus, Silvanus,* &c.

Sometimes the mandibles are entirely exposed, salient and robust. The body is generally elongated, narrow, and depressed. These insects form the genus

TROGOSITA, *Olivier.*

In Trogosita proper the mandibles are shorter than the head and crossed; the ligula, almost square, is not prolonged between the palpi, and the maxillæ have but a single lobe.

FAMILY III.

PLATYSOMA*.

OUR third family of the Tetramera approaches the second, so far as relates to the internal anatomy, the tarsi, and habits; but the antennæ are of equal thickness throughout, or more slender towards the extremity. The mandibles are always salient, the ligula is bifid or emarginated; the palpi are short, the body is depressed and elongated, and the thorax almost square. These insects are found under the bark of trees, and may be reduced to a single genus, the

CUCUJUS, *Fabricius,*

Where the antennæ, much shorter than the body in several, are composed of obconical or turbiniform and almost granose joints, the first of which is shorter than the head.

There are two subgenera, *Dendrophagus* and *Uleoiota.*

FAMILY IV.

LONGICORNES†.

HERE, the under part of the three first joints of the tarsi is furnished with a brush; the second and third are cordiform; the fourth is deeply bilobate, and there is a little nodule resembling a joint at the base of the last. The ligula, placed on a short and transversal mentum, is usually membranous, cordiform,

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* Flat-bodied. † Long-horned.

emarginated or bifid, corneous and forming the segment of a very short and transversal circle in others. The antennæ are filiform or setaceous, most commonly as long at least as the body; they are sometimes simple in both sexes, and sometimes serrated, pectinated, or flabelliform in the males. The eyes of a great many are reniform and surround them at base. The thorax is trapezoidal or narrowed before, in those where the eyes are rounded and entire, or but slightly emarginated; even in this case the legs are long and slender, and the tarsi elongated.

As almost all their larvæ live in the interior of trees, or under their bark, they are destitute of feet, or have but very small ones. Their body is soft, whitish, thickest anteriorly, and the head squamous and provided with stout mandibles, but without any other projecting part. They do much injury to trees, the large ones particularly, perforating them very deeply, or boring holes in them in every direction. Some of them attack the roots of plants. The abdomen of the females is terminated by a tubular and horny ovipositor. These insects produce a small sharp sound by the rubbing of the pedicle of the base of their abdomen against the interior of the parieties of the thorax.

We will in the first place divide the Longicornes into two sections. In those of the first, the eyes are either strongly emarginated or lunate, or elongated and narrow; the head is plunged into the thorax, as far as those organs, without being distinguished from it by an abrupt contraction of its diameter, forming a kind of neck; in several it is vertical.

These Longicornes are subdivided into two principal sections or small tribes.

1. The Prionii, characterised as follows: the labrum null or very small and indistinct; the mandibles stout, or even very large, particularly in most of the males; the internal lobe of the maxillæ null or very small; the antennæ inserted near the base of the mandibles or the emargination of the eyes, but not surrounded by the latter at base; the thorax most frequently trapezoidal or square, crenated or dentated laterally.

The first genus, or

Parandra, *Latreille*,

Where, as in the following, the antennæ are simple, almost granose, compressed, of equal thickness throughout, and as long as the thorax at most, is distinguished from that genus, as well as from all others of the same family, by its corneous ligula, which is in the form of the segment of a very short, transversal circle without emargination or lobes. The body is a parallelopiped, and depressed, and the thorax square, rounded at the posterior angles, and without spines or teeth. These insects are peculiar to America.

Spondylis, *Fabricius*.

The Spondyles, which approximate to the Parandræ in their antennæ and the exiguity of their maxillary lobes, are removed from them by their ligula; the

latter, as in all the following Longicornes, is membranous and cordiform. The Spondyles are also distinguished from the following genera by their almost globular thorax, the margin of which is neither recurved nor furnished with teeth or spines.

Their larvæ live in the interior of European pines and firs.

In the third and last genus of this tribe, or

Prionus, *Geoffroy, Fabricius, Olivier,*

The antennæ are longer than the head and thorax, serrated or pectinated in some; simple, attenuated near the extremity, and with elongated joints in others. The body is generally depressed, and the thorax square or trapezoidal, and either dentated or spinous, or angular laterally.

These insects only fly towards evening or at night, and always remain on trees. Certain species foreign to Europe are remarkable for their great size, and that of their mandibles. The larva of the *P. cervicornis,* which lives in the wood of the Gossampinus, is eaten.

2. The Cerambycini have a very apparent labrum extending across the whole width of the anterior extremity of the head; their two maxillary lobes are very distinct and salient; their mandibles of an ordinary size, and similar or but little different in both sexes; their eyes always emarginated and surrounding, at least partially, the base of the antennæ, which are usually as long as the body or longer; the thighs, or the four anterior ones at least, are commonly in the form of an ovoid or oval club, narrowed into a pedicle at base.

The various genera of modern entomologists may all be united in the genus

Cerambyx,

C. heros. Fabricius. Length one inch and a half; black; extremity of the elytra brown and prolonged into a small tooth at the suture; thorax extremely rugose and with a pointed or spiniform tubercle on each side; antennæ simple. Common in all the warm and temperate parts of Europe. The larva bores deep holes in the Oak, and is perhaps the Cossus of the ancients.

We will terminate this tribe with insects, which, in relation to their palpi, form of their head, thorax and elytra, as well as in their proportions, present remarkable exceptions or anomalies.

We will commence with those in which the form of the thorax is very analogous to that of the preceding ones.

Obrium, *Miger,*

Is characterised as follows: the head rounded, and not prolonged anteriorly in the manner of a snout; palpi filiform, the last joint terminating in a point; antennæ long and setaceous; thorax long, narrow, almost cylindrical, or forming a truncated oval.

Rhinotragus, *Dalman*,

Differs from the preceding one in the head, which is narrowed and prolonged anteriorly in the manner of a snout; in the palpi, of which the last joint is rather thicker than the preceding ones, and truncated at the end; in the antennæ, shorter than the body, slightly dilated and somewhat serrated at the extremity; and in the almost orbicular thorax.

Necydalis, *Linnæus*.

The only one of this tribe in which the elytra are either very short, and squamiform, or prolonged, as usual, to the extremity of the abdomen, but abruptly contracted a little beyond their origin, then much narrowed, and terminating in a point or subulate. Their abdomen is long, narrow, contracted, and as if pediculated at base. The wings are folded at their extremity.

Certain insects generally proper to the African islands, New Holland, New Ireland and New Zealand, ambiguous in several respects, and which, in a natural order, should perhaps be placed between the Lamiariæ and the Lepturetæ, will terminate the division of the Cerambycini.

Their palpi are almost filiform, the last joint almost cylindrical, and somewhat attenuated towards the base; their thorax is usually smooth or but slightly uneven, without acute tubercles, and becomes widened posteriorly, or presents the form of a trapezium or truncated cone, as in the last tribe of this family; the abdomen in the greater number is almost in the form of a reversed triangle, and the elytra are truncated at the extremity.

These insects form four genera: *Distichocera*, *Tmesisternus*, *Tragocerus*, and *Leptocera*.

The Longicornes of our third tribe, that of the Lamiariæ, are distinguished by their vertical head, and by their palpi, which are filiform or hardly larger at the extremity, and terminated by a joint more or less ovoid and tapering to a point. The outer lobe of the maxillæ is slightly narrowed at the end, and curved on the inner division. The antennæ are most frequently setaceous and simple, and the thorax, exclusive of the lateral tubercles or spines, is nearly of an equal width throughout. Some species are apterous, a character exhibited by no other division of this family.

Acrocinus, *Illiger*.

Distinguished from all the Longicornes, by the thorax, each side of which is terminated by a moveable tubercle, terminating in a point, or by a spine. The body is flattened, and the thorax transversal; the antennæ are long and slender, and the anterior legs longer than the others; the elytra are truncated at the end and terminated by two teeth, the exterior of which is the strongest.

A. longimanus; known by the vulgar name of the *Cayenne Harlequin.* The thighs and tibiæ of the two anterior legs are very long and slender. The moveable tubercles of the thorax are terminated by a strong spine, and the elytra are beautifully variegated with grey, red, and black.

All the remaining Lamiariæ compose but the single genus

Lamia,

Which we will separate into two sections; those in which the sides of the thorax are sometimes tuberculous or rugose and sometimes spinous, and those in which it is smooth and cylindrical.

They are arranged under various subgenera, such as *Acanthocinus*, *Tetraopes*, *Monochamus*, *Saperda*, &c.

In the fourth and last tribe, that of the Lepturetæ, we find Longicornes in which the eyes are rounded, entire, or scarcely emarginated, and where, in this case, the antennæ are inserted before, or at most at the anterior extremity of this slight emargination. The head is always inclined posteriorly behind the eyes in several, or abruptly narrowed at its junction with the thorax, in the manner of a neck; the thorax is conical or trapezoidal and narrowed before. The elytra become gradually narrower.

This tribe forms the genus

Leptura, *Linnæus,*

With the exception of certain species which belong to the preceding tribes and to the Donaciæ. In Leptura Proper the head is abruptly narrowed immediately behind the eyes. The antennæ, inserted near the anterior extremity of their internal emargination, are remote at base. The two eminences from which they rise are almost confounded in one plane. The thorax is almost always smooth or without lateral tubercles.

FAMILY V.

EUPODA.

Our fifth family of the tetramerous Coleoptera is composed of insects, the first of which so closely approach the last Longicornes that they were confounded both by Linnæus and Geoffroy, and the last are so closely allied to the Chrysomelæ, the type of the following family, that the first of those naturalists places them in that genus. The organs of manducation present the same affinities. Thus in the first, the ligula is membranous, bifid or bilobate, as in the Longicornes; their maxillæ also greatly resemble those of those latter; but in the last this ligula is almost square or rounded, and analogous to that of the Cyclica.

The maxillary lobes, however, are membranous, or but slightly coriaceous, whitish or yellowish; the external one is widened near the extremity, &c. The posterior thighs are strongly inflated in a great many, and hence the denomination of the family.

All these insects have wings, and are found on the stems or leaves of various plants, but, so far as regards a great number of species that inhabit France, on those of the Liliaceæ particularly. The larvæ of some—the Donaciæ—attack the internal part of the roots of aquatic plants, on which we find the perfect insect. Those of several others live exposed, but they cover themselves with matters with which they form a sort of case or scabbard, like that of the Cassidæ.

We will divide this family into two tribes:

The first, that of the SAGRIDES, is composed, as its name indicates, of the genus

SAGRA.

The mandibles terminate in a sharp point. The ligula is profoundly emarginate or bilobate. The Sagræ properly so called, originally designated by the name of *Alurnæ*, are exclusively confined to certain parts of southern Africa, Ceylon and China. Their palpi are terminated by an ovoid joint, the divisions of the ligula are short, the thorax is cylindrical, the antennæ are almost filiform, longer than the head and thorax, with their inferior joints shorter than the others, and the four anterior tibiæ tolerably thick, but slightly elongated, angular and straight. These insects have a uniform but very brilliant colour, green, golden, or a fulgid-red, with a slight mixture of violet.

There are three subgenera, *Megalopus*, *Orsodacna*, *Psammœcus*.

The second tribe, or that of the CRIOCERIDES, is distinguished from the preceding by the mandibles, the extremity of which is truncated or presents two or three teeth, and by the ligula, which is entire or but slightly emarginated.

It is composed of the genus

CRIOCERIS, *Geoffroy*,

Which is now divided into *Donacia*, *Hæmonia*, *Petauristes*, *Crioceris proper*, &c. In some of these, the mandibles taper to a point, and present two or three teeth at the extremity: the palpi are filiform. The antennæ of an ordinary thickness, are almost granose in some, and in others composed of obconical joints, thicker at their superior extremity. The *Donacea* are frequently ornamented with brilliant bronzed or gilded colours. Several species are also covered with an extremely fine and silky down; they generally live on aquatic plants.

FAMILY VI.

CYCLICA.

In our sixth family of the Tetramera, where the three first joints of the tarsi are still spongy, or furnished with pellets beneath, with the penultimate divided into two lobes, and where the antennæ are filiform or somewhat thicker towards the end, we observe a body usually rounded, and in those few where it is oblong, with the base of the thorax of the width of the elytra and maxillæ, whose exterior division, by its narrow, almost cylindrical form, and darker colour, has the appearance of a palpus; the interior division is broader and destitute of the little squamous nail. The ligula is almost square or oval, entire or widely emarginated.

These insects are generally small, and are frequently ornamented with brilliant and metallic colours; their body is smooth or destitute of hairs. They are mostly slow and timid, letting themselves fall to the ground the moment we attempt to seize them, or folding their antennæ and feet close to their body. Several species are good jumpers. The females are extremely prolific.

If we take into consideration the different habits of their larvæ, we will find that the Cyclica are divided into four principal sections:

In the first, or the CASSIDARIÆ, the antennæ are inserted in the superior part of the head, and are approximated, straight, short, filiform and almost cylindrical, or gradually enlarged towards the extremity. The mouth, altogether underneath, and with short and almost filiform palpi, is sometimes arched and sometimes partly received into the cavity of the præsternum. The eyes are ovoid or round. The legs are contractile and short, and the tarsi flattened; the lobes of the penultimate joint completely enclose the last.

The body being flat above, these insects, owing to the disposition of their tarsi, are enabled to glue themselves to the surface of leaves and to remain there without motion; besides this, the body is most commonly orbicular or oval, and overlapped all round by the thorax and elytra. The head is concealed under the thorax, or received into its anterior emargination. Their colours are various, and are prettily distributed in the form of spots, points, and streaks. Such of their larvæ as are known to us cover themselves with dirt.

The Cassidariæ are composed of two genera. In the first, or

HISPA, *Linnæus*,

The body is oblong, the head is entirely exposed and free, and the thorax forms a trapezium. The mandibles have but two or three teeth; the exterior maxillary lobe is shorter than the inner one; the antennæ are filiform and pectinated anteriorly. The Hispæ properly so called, have short mandibles terminated by two or three small and almost equal teeth. America produces

a great number of species. In some the superior surface of the body, and even a portion of the antennæ, are densely spinous.

Cassida, *Linnæus, Fabricius.*

The Cassidæ are distinguished from the Hispæ by the following characters. The body is orbicular or almost ovoid, and in some few nearly square. The thorax, more or less semicircular, or forming the segment of a circle, entirely conceals and covers the head, or encloses it in an anterior emargination. The elytra, frequently elevated in the region of the scutellum, project beyond the body. The mandibles present four teeth at least, and the exterior maxillary lobe is at least as long as the inner one.

In the second tribe, or the Chrysomelinæ, the antennæ are remote, and inserted before the eyes, or near their internal extremity. These insects never leap. Those species in which we find the above-mentioned characters, form, as in the earlier entomological works of Fabricius, two genera. The first, or

Cryptocephalus,

Is composed of Chrysomelinæ, in which the head is plunged vertically into an arched or hood-like thorax, in such a manner that the body, most commonly in the form of a short cylinder, or almost ovoid and narrowed anteriorly, when viewed from above, appears as if truncated at that extremity and destitute of a head. The antennæ of some are more or less serrated or pectinated; those of others are long and filiform. The last joint of the palpi is always ovoid.

Chrysomela.

The body is usually ovoid or nearly oval, and the head salient, projecting, or simply inclined; where the antennæ are simple, about half the length of the body, and most frequently granose and insensibly enlarged towards the extremity.

C. populi, Lin. Length from five to six lines; oval, oblong, and blue; elytra fulvous or red, and the inner angle of their extremity marked with a black dot. On the willow and poplar; its larva lives on the same trees, and frequently in society.

In the third and last tribe of the Cyclica, that of the Galerucitæ, we find antennæ always at least as long as the half of the body, of equal thickness throughout, or insensibly thicker towards their extremity, inserted between the eyes, at but little distance from the mouth, and usually approximated at base, and near a small longitudinal carina. The maxillary palpi, thickest about the middle, terminate in two joints, in the form of a cone, but opposed or united at base, the last short, and either truncated or obtuse or pointed. The body is sometimes ovoid or oval, and sometimes almost hemispherical. In several, and particularly the smaller species, the posterior thighs are very stout, which enables them to leap.

This tribe is composed of the genus

Galeruca,

Which is divided into two principal sections; those which are destitute of the power of leaping or the Isopoda, and the Jumpers or the Anisopoda.

G. calmariensis. Three lines in length; yellowish or greenish above; three black spots on the thorax; another with a stripe of the same colour on each elytron.—This species, together with its larva, is found on the elm; in certain seasons, when unusually abundant, it strips these trees of their foliage, and does as much mischief as certain caterpillars.

The jumping Galerucitæ, or those whose posterior thighs are inflated, and which are distributed by Fabricius among the genera *Chrysomela, Galeruca,* and *Crioceris,* are united in one, that of *Altica* or *Haltica,* in the systems of Geoffroy, Olivier, and Illiger. These insects are very small, but are ornamented with various or brilliant colours; they jump with great quickness and to a very great height, and frequently destroy the leaves of those plants on which they feed. Their larvæ devour the parenchyma, and there undergo their metamorphosis. Certain species, those particularly which are commonly termed *garden fleas,* are very injurious in both states to our kitchen gardens. Of all countries, South America furnishes the greatest number.

Altica, *Latreille.*

In the true Alticæ, the head is salient, and the posterior tibiæ are truncated at their extremity and without any particular prolongation or forked spine; the tarsus originates from this extremity, and its length is not equal to half that of the tibia.

A. oleracea. About two lines in length; oval, elongated; green or bluish; a transverse impression on the thorax; elytra finely punctured. On vegetables. It is the largest of the European species.

FAMILY VII.

VIPALPI.

The insects of our seventh and last family of the Tetramera are distinguished from all those of the same section, having, like them, the under part of the three first joints of the tarsi furnished with brushes and the penultimate bifid, by their antennæ, which are terminated in a very distinct and perfoliated club, as well as by their maxillæ, armed on the inner side by a nail or corneous tooth. In some few, the joints of the tarsi are entire, but they are removed from the other Tetramera with analogous tarsi by their body, which is almost globular and contracts into a ball.

Their body is most commonly of a rounded form, and frequently even very convex and hemispherical; the antennæ are shorter than the body, the man-

dibles emarginated or dentated at the extremity, and the palpi terminated by a large joint; the last joint of the maxillary palpi is very large, transversal compressed, and almost lunate. The form of their organs of manducation shows them to be gnawers, and in fact the species indigenous to Europe are found in the Boleti which grow on the trunks of trees, under their bark, &c.

Some have the penultimate joint of the tarsi bilobate, and do not contract themselves into a ball.

They may be reunited in the single genus

Erotylus, *Fabricius.*

In the Erotyli properly so called, the intermediate joints of the antennæ are almost cylindrical, and the club, formed by the last ones, is oblong; the interior and corneous division of their maxillæ is terminated by two teeth.

They are peculiar to South America.

In the fourth section of the Coleoptera, that of the Trimera, there are but three joints to all the tarsi. The Trimera form three families. Those of the two first are closely related to the last of the Tetramera. Their antennæ, always composed of eleven joints, terminate in a club formed by the three last, which is compressed and in the form of a reversed cone or triangle. The first joint of the tarsi is always very distinct; the penultimate is usually bilobate, and the last, which presents a knot at base, is always terminated by two hooks. The elytra entirely cover the abdomen and are not truncated.

FAMILY I.

FUNGICOLÆ.

In our first family of this section we observe antennæ longer than the head and thorax united, an oval body, and a trapezoidal thorax. The maxillary palpi are filiform or a little thicker at the end, but are terminated by a very large and securiform joint. The penultimate joint of the tarsi is always deeply bilobate.

This family may be reduced to one great genus.

Eumorphus, *Fabricius.*

In the Eumorphi proper, the club of the antennæ is abrupt, compact, strongly compressed, and in the form of a reversed triangle. The maxillary palpi are filiform, and the two last joints of the labials united form a triangular club. In some, however, the third joint of the antennæ is much longer than in others, and authors have divided them into *Dapsa*, where the club of the antennæ is narrow, elongated, and jointed; *Endomychus*, where the four palpi are thickest at the extremity, and the three last joints of the antennæ separated laterally, composing a club in the form of a reversed triangle.

They are all peculiar to America and the East Indies.

FAMILY II.

APHIDIPHAGI.

This family consists mostly of insects which have an almost hemispherical body, and a very short, transversal, and almost lunate thorax. Their antennæ terminate in a compressed and obconical club, composed by the three last joints, and are shorter than the thorax. The last joint of the maxillary palpi is very large and securiform, and the penultimate joint of the tarsi is profoundly bilobate.

In the other Trimera of the same family, the joints of the tarsi are simple, and the penultimate at least is slightly bifid, which, with some other characters, distinguishes these insects from the Fungicolæ.

Coccinella.

In Coccinella proper, the body is almost hemispherical, the thorax very short, almost lunate, the margin not recurved or but very slightly, and the penultimate joint of the tarsi profoundly bilobate.

Various species of this genus are extremely common on the trees and plants of our gardens, and frequently in our houses; they are known by the names of *Cow-bug*, *Lady-bug*, &c. They feed on Aphides, their larvæ, which in form and their metamorphoses greatly resemble those of the Chrysomelæ, employing the same aliment.

There, the body is much flattened, in the form of a shield, and the head is concealed under an almost semicircular thorax. The antennæ present distinctly but nine joints, and terminate in an elongated club. The joints of the tarsi are entire. The præsternum forms a sort of chin-cloth anteriorly. Such are the characters of the genus

Clypeaster, *Andersch.*

They are found under the bark of trees, and under stones.

FAMILY III.

PSELAPHII.

These insects, which constitute our third and last family of the Trimera, in their short and truncated elytra that only cover part of the abdomen, bear a certain resemblance to the Bachelytra, and particularly to the Aleocharæ. This last part of their body, however, is much shorter, wide, very obtuse and rounded posteriorly. The antennæ, terminated by a club or thicker towards the extremity, sometimes consist of but six joints. The maxillary palpi are

usually very large, and all the joints of the tarsi are entire; the first, much shorter than the following ones, is scarcely visible at the first glance, and the last is most commonly terminated by a simple hook.

They are found on the ground under the debris of vegetable matters; some inhabit certain ant-hills.

Those which have eleven joints in the antennæ form the genus

PSELAPHUS, *Herbst.*

In the last of the Pselaphii, we observe this peculiarity—their antennæ consist of but six joints, or even one. They form the genus

CLAVIGER,

Where the antennæ consist of six distinct joints. These insects have no apparent eyes. The maxillary palpi are very short, without distinct articulations, and with two terminal hooks. The two first joints of the tarsi are very short; the third and last is very long, with a single hook at the extremity.

These Pselaphii are found under stones in barren localities, and even in the hills of certain small, yellow ants.

ORDER VI.

ORTHOPTERA *.

In the insects of this order, we find the body generally less indurated than in the Coleoptera, and soft, semi-membranous elytra furnished with nervures, which, in the greater number, do not join at the suture in a straight line. Their wings are folded longitudinally, most frequently in the manner of a fan, and divided by membranous nervures running in the same direction. The maxillæ are always terminated by a dentated and horny piece covered with a *galea*, an appendage corresponding to the exterior division of the maxillæ of the Coleoptera. They have also a sort of tongue or epiglottis.



The Orthoptera undergo a semi-metamorphosis, of which all the mutations are reduced to the growth and development of the elytra and wings, that are always visible in a rudimental state in the nymph. As both this nymph and the larva are otherwise exactly similar to the perfect insect, they walk and feed in the same way.

The mouth of the Orthoptera consists of a labrum, two mandibles, as many maxillæ, and four palpi; those of the jaws always have five joints; whilst the

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* Straight-winged.

labials, as in the Coleoptera, present but three. The mandibles are always very strong and corneous, and the ligula is constantly divided into two or four thongs. The form of the antennæ varies less than in the Coleoptera, but they are usually composed of a greater number of joints. Several, besides their reticulated eyes, have two or three ocelli. The inferior surface of the first joints of the tarsi is frequently fleshy or membranous. Many females are furnished with a true perforator formed of two blades, frequently enclosed in a common envelope, by means of which they deposit their eggs. The posterior extremity of the body, in most of them, is provided with appendages.

All the known Orthoptera, without exception, are terrestrial, even in their two first states of existence. Some are carnivorous or omnivorous, but the greater number feed on living plants.

We will divide the Orthoptera into two great families.

In those which compose the first, all the legs are similar, and only adapted for running,—they are the *Cursoria* or runners. In those which constitute the second, the posterior pair of thighs are much larger than the others, thereby enabling them to leap. Beside this, the males produce a sharp or stridulous noise—they are the *Saltatoria* or jumpers.

FAMILY I.

CURSORIA.

In this family the posterior legs, as well as the others, are solely adapted for running. Almost all these insects have their elytra and wings laid horizontally on the body; the females are destitute of a corneous ovipositor. They form three genera: in the first or the

Forficula, *Linnæus,*

There are three joints in the tarsi; the wings are plaited like a fan, and folded transversely under very short and crustaceous elytra with a straight suture; the body is linear, with two large, squamous, mobile pieces, which form a forceps at its posterior extremity.

These insects are very common in cool and damp places, frequently collect in troops under stones and the bark of trees, are very injurious to our cultivated fruits, devour even their dead congeners, and defend themselves with their pincers, which frequently vary in form, according to the sex. It has been thought that they insinuate themselves into the ear, and to this they owe their name of *Ear-wigs*.

Blatta, *Linnæus.*

Cockroaches have five joints to all the tarsi. The wings are only plaited longitudinally, the head is concealed under the plate of the thorax, and the body oval, orbicular and flattened.

The Blattæ are very active nocturnal insects, some of which live in the interior of our houses, particularly the kitchen, in bake-houses and flour mills; the others inhabit the country. They are extremely voracious, and consume all sorts of provisions.

Mantis, *Linnæus.*

Here also we find five joints in all the tarsi, and wings simply plaited longitudinally; but the head is exposed, and the body narrow and elongated.

They also differ from the Blattæ in their short palpi terminating in a point, and in their quadrifid ligula.

These insects, which are only found in southern and temperate climates, remain on plants or trees, frequently resemble their leaves and branches in the form and colour of the body, and are diurnal. Some of them are rapacious and others herbivorous. Their eggs are usually enclosed in a capsule formed of some gummy substance, which hardens by exposure to the air, and divided internally into several cells; it is sometimes in the form of an oval shell, and at others in that of a seed, with ridges and angles, and even bristled with little spines. The female glues it on a plant or other body raised above the earth.

M. religiosa, Lin. So called from the position to which it raises its anterior legs or arms, which resembles that of supplication. The Turks entertain a religious respect for this animal, and another species is held in still greater veneration by the Hottentots.

In the others, the anterior legs resemble the following ones. The eyes are simple, very indistinct, or null; and the first segment of the trunk is shorter, or at most as long as the following one.

These insects have singular forms resembling twigs of trees or leaves. They appear to feed exclusively on vegetables, and like several Grylli are coloured like the plants on which they live. There is frequently a great difference between the sexes.

They form the subgenus

Spectrum, *Stoll*,

Which has been again divided into others.

FAMILY II.

SALTATORIA.

The posterior legs of the insects which compose our second family of the Orthoptera, are remarkable for the largeness of their thighs, and for their spinous tibiæ, which are adapted for saltation.

The males summon their mates by a stridulous noise, vulgarly termed singing. This is sometimes produced by rapidly rubbing against its antagonist

an interior and more membranous portion of each elytron which resembles a piece of talc. It is sometimes excited by a similar motion of their posterior thighs upon the elytra and wings, acting like the bow of a violin.

The greater number of the females deposit their eggs in the earth.

This family is composed of the genus

Gryllus, *Linnæus.*

This great genus, which formerly comprised the various insects commonly termed here *Grasshoppers, Crickets, Katy-dids,* &c., is now divided into various genera and subgenera. Among the most noted of these we have

Gryllo-Talpa, *Latreille.*

Where the tibiæ and tarsi of the two anterior legs are wide, flat and dentated, resembling hands, or are adapted for digging. The other tarsi are of the ordinary form, and terminated by two hooks; the antennæ are more slender at the end, elongated and multiarticulated.

G. vulgaris. (The Mole-Cricket.) Length one inch and a half; brown above, reddish-yellow beneath; anterior tibiæ with four teeth; wings double the length of the elytra. This species is but too well known by the mischief it effects in gardens and cultivated grounds. It lives in the earth, where its two anterior legs, which act like a saw and shovel, or like those of a mole, open a passage for it. It cuts and separates the roots of plants, but not so much for the purpose of eating them as to clear its road, for it feeds, as it appears, on worms and insects. The cry of the male, which is only heard at night, is soft and agreeable.

In June and July, the female digs a rounded, smooth, subterranean cavity, about six inches in depth, in which she deposits from two to four hundred eggs; this nest, with the gallery that leads to it, resembles a bottle with a curved neck. The young remain together for some time.

Acrydium Proper.

They fly by starts, and to a considerable height. The wings are frequently very prettily coloured, particularly with red and blue, as observed in several species that inhabit France. The thorax, in some of those that are foreign to Europe, frequently exhibits crests and large warts, in a word, a singular variety of forms.

Certain species, called by travellers *Migratory Locusts**, sometimes unite in incalculable numbers and emigrate, resembling in their passage through the

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* The pupil must not allow himself to be deceived by names. This insect is what we commonly call a *Grasshopper.* The *Locust,* so called in this country, is a totally different insect, and belongs to another order. See *Hemiptera,* genus *Cicada* or *Tettigonia.*—*Am. Ed.*

air, a thick and heavy cloud; wherever they alight all signs of vegetation quickly disappear, and a desert is speedily created. Their death frequently forms another scourge, as the air becomes poisoned by the frightful mass of their decomposing bodies.

M. Miot, in his excellent translation of Herodotus, has given it as his opinion, that the heaps of bodies of winged serpents which that historian states he saw in Egypt, were nothing more than masses of this species of Acrydium. In this I perfectly agree with him.

These insects are eaten in various parts of Africa, where the inhabitants collect them for their own use and for commerce. They take away their elytra and wings and preserve them in brine.

A considerable part of Europe is frequently devastated by the

A. migratorius. Length two inches and a half; usually green, with obscure spots; elytra light brown spotted with black; a low crest on the thorax. The eggs are enveloped in a frothy and glutinous flesh-coloured matter, forming a cocoon, which the insect is said to glue to some plant. Common in Poland.

The south of Europe, Barbary, Egypt, &c., are frequently devastated in like manner by other species, some of which are rather larger.

ORDER VII.

HEMIPTERA*.

The Hemiptera, according to our system, terminate the numerous division of insects which are provided with elytra, and of all those, are the only ones which have neither mandibles nor maxillæ properly so called. A tubular, articulated, cylindrical, or conical appendage curved inferiorly, or directed along the pectus, having the appearance of a kind of rostrum, presents along its superior surface, when raised, a groove or canal from which may be protruded three rigid, scaly, extremely fine, and pointed setæ, covered at base by a ligula. These setæ, when united, form a sucker resembling a sting, sheathed in the tubular apparatus we have just described, where it is kept in situ by the superior ligula placed at its base. The inferior seta consists of two filaments which are united into one at a little distance from their origin, so that in reality the sucker is composed of four pieces.



The mouth of Hemipterous insects is only adapted for extracting fluids by suction; the attenuated stylets of which the sucker is formed, pierce the vessels of plants and animals, and the nutritious fluid, being successively com-

* Half-winged, the *Ryngota*, Fabricius.

pressed, is forced into the internal canal, and thus arrives at the œsophagus. The sheath of this apparatus is at these times frequently bent into an angle, or becomes geniculate. These insects, like other Suctoria, are furnished with salivary vessels.

In most of the insects which compose this order, the elytra are coriaceous or crustaceous, the posterior extremity being membranous and forming a sort of an appendage to them; they almost always decussate; those of the other Hemiptera are simply thicker and larger than the wings, semi-membranous, like the elytra of the Orthoptera, and sometimes opaque and coloured, sometimes transparent and veined. There are a few longitudinal plicæ in the wings.

Several have ocelli, of which, however, there are frequently but two.

The Hemiptera exhibit the same forms and habits in their three states. The only change they experience consists in the development and growth of the volume of the body.

I divide this order into two sections.

In the first, that of the HETEROPTERA, Lat., the rostrum arises from the front; the elytra are membranous at the extremity, and the first segment of the trunk, much larger than the others, alone forms the thorax. The elytra and wings are always horizontal or slightly inclined. This section is composed of two families.

FAMILY I.

GEOCORISÆ.

IN this family the antennæ are exposed, longer than the head, and inserted between the eyes, near their internal margin. There are three joints in the tarsi, the first of which is sometimes very short.

It forms the genus

CIMEX, *Linnæus.*

This genus (an example of which may be found in our common *Squash-bug*) is now divided into forty or more subgenera. We all know but too well that of CIMEX proper.

In Cimex proper the body is very flat, but the antennæ terminate abruptly in the form of a seta.

C. lectularius, Lin. It is pretended that this insect, vulgarly termed the *Bed-bug*, did not exist in England previous to the fire of London in 1666, and that it was transported thither in timber from America. With respect to the continent of Europe, however, we find that it is mentioned by Dioscorides. It has also been asserted that this species sometimes acquires wings. It likewise harasses young pigeons, swallows, &c.; but that which lives on these latter birds appears to me to be a different species.

FAMILY II.

HYDROCORISÆ.

In our second family of the Hemiptera, the antennæ are inserted and concealed under the eyes; they are shorter than the head, or hardly as long.

All these insects are aquatic, carnivorous, and seize others with their anterior legs, which flex on themselves and act as pincers. They sting severely.

Their tarsi present but one or two joints. Their eyes are in general remarkably large.

NEPA, *Linnæus,*

Or the *Aquatic Scorpions*. This genus is now variously divided. In

Nepa proper, the anterior tarsi have but one joint, and the four posterior ones two, and where the antennæ appear forked. The rostrum is curved beneath; the coxæ of the two anterior legs are short, and their thighs much wider than their other parts.

Their body is narrow and elongated and almost elliptical. Their abdomen is terminated by two setæ which enable them to respire in the oozy and aquatic localities at the bottom of which they live. Their eggs resemble the seed of a plant of an oval figure, crowned with a tuft of hairs.

The other subgenera of the *Nepides* are *Galgulus*, *Naucoris*, *Belostoma*, &c.

The others—*Notonectides*—have their two anterior legs simply curved underneath, with thighs of an ordinary size, and the tarsi pointed and densely ciliated, or similar to those of the posterior ones. Their body is almost cylindrical or ovoid, and tolerably thick or less depressed than in the preceding insects. Their posterior legs are densely ciliated, resemble oars, and are terminated by two very small and rather indistinct hooks. They swim or row with great swiftness, and frequently while on their back. They compose the genus

NOTONECTA, *Linnæus,*

Which has been divided into CORIXA and NOTONECTA PROPER.

The second section of the Hemiptera, that of the HOMOPTERA, Lat., is distinguished from the preceding one by the following characters: the rostrum arises from the lowest portion of the head, near the pectus, or even from the interval between the two anterior legs: the elytra—almost always tectiform—are of the same consistence throughout and semimembranous, sometimes almost similar to the wings. The three segments of the trunk are united en masse, and the first is frequently shorter than the second.

All the insects of this section feed exclusively on vegetable juices. The females are provided with a scaly ovipositor, usually composed of three dentated blades, and lodged in a groove with two valves. They use it as a saw to produce openings in plants in which they deposit their eggs. The last insects of this section experience a sort of complete metamorphosis.

I will divide it into three families.

FAMILY I.

CICADARIÆ.

This family comprises those which have triarticulated tarsi, and usually very small, conical, or fusiform antennæ, composed of from three to six joints, the extremely attenuated seta which terminates them included. The females are provided with a serrated ovipositor.

Some—*Singers*—have antennæ composed of six joints, and three ocelli.

Cicada, *Olivier*.—Tettigonia, *Fabricius*.

These insects (the Locusts), of which the elytra are almost always transparent and veined, differ from the following ones, not only in the composition of their antennæ, and the number of the ocelli, but in the absence of the faculty of leaping and in the music of the males; which, in heat of summer, the epoch of their appearance, produce that loud and monotonous sound which has induced authors to designate them by the name of Cantatrices or Singers.

The organs by which it is effected are situated on each side of the base of the abdomen: they are internal, and each one is covered by a cartilaginous plate, which closes like a shutter. The cavity which encloses this apparatus is divided into two cells by a squamous and triangular septum. When viewed from the side of the abdomen, each cell presents anteriorly a white and plaited membrane, and lower down, in the bottom, a tight, thin, transparent membrane, which Réaumur terms "*le miroir*." If this part of the body be opened above, another plaited membrane is seen on each side, which is moved by an extremely powerful muscle composed of numerous, straight, and parallel fibres, and arising from the squamous septum. This membrane is the tymbal. The muscles, by rapidly contracting and relaxing, act on the tymbals, alternately tightening and restoring them to their original state. Such is the origin of these sounds, which can even be produced after the death of the insect, by jerking the muscle.

The Cicadæ live on trees or shrubs, of which they suck the juices. The female, by means of an ovipositor enclosed in a bilaminated, semitubular sheath, and composed of three narrow, elongated, squamous pieces, two of which terminate in the form of a file, pierces the dead twigs to the medulla,

in which she deposits her eggs. As the number of the latter is considerable, she makes several holes, indicated externally by as many elevations. The young larvæ however leave their asylum to penetrate into the earth, where they grow and experience their metamorphosis. Their anterior legs are short, have very stout thighs armed with teeth, and are adapted for digging. The Greeks ate the pupæ, which they called *Tettigometra*, and even the perfect insect.

The *C. orni*, by wounding the tree from which its specific name is derived, produces that peculiar honey-like and purgative juice called *manna*. This species is about an inch long; yellowish; pale beneath, the same colour mixed with black above; margin of the abdominal segments, russet; two rows of blackish points on the elytra, those nearest their inner margin the smallest. South of France, Italy, &c.

The other Cicadariæ—*Mutes*—have but three distinct joints in the antennæ, and two small ocelli. Their legs are usually adapted for leaping. Neither of the sexes is provided with organs of sound.

The elytra are frequently coriaceous and opaque. Several females envelope their eggs with a white substance resembling cotton.

Some of them—*Fulgorellæ*—have the antennæ inserted immediately under their eyes, and the front frequently prolonged in the form of a snout, the figure of which varies according to the species. By this we distinguish the genus

FULGORA, *Linnæus, Olivier,*

Now variously subdivided.

In the last of the Cicadariæ, the antennæ are inserted between the eyes; they compose the genus

CICADELLA,

Which is divided into *Membracis, Tragopa, Darnis,* &c. &c.

FAMILY II.

APHIDII.

THE second family of the homopterous Hemiptera, or the fourth of the order, is distinguished from the preceding one by the tarsi, which are composed of but two joints, and by the filiform or setaceous antennæ, which are longer than the head, and have from six to eleven joints.

Those individuals which are winged always have two elytra and two wings.

These insects are very small; their body is usually soft, and their elytra are nearly similar to the wings, or only differ from them in being larger and somewhat thicker. They are astonishingly prolific.

Here the antennæ are composed of from ten to eleven joints, the last of which is terminated by two setæ.

They possess the faculty of leaping, and form the genus

PSYLLA, *Geoffroy*.—CHERMES, *Linnæus*.

These Hemiptera, also called pseudo-aphides, or faux-pucerons, live on the trees and plants from which they derive their nourishment; both sexes are furnished with wings. Their larvæ usually have a very flat body, broad head, and the abdomen rounded posteriorly. Their legs are terminated by a little membranous vesicle accompanied beneath with two hooks. Four wide and flat pieces, which are the sheaths of the elytra and wings, distinguish the nymph. Several in this state, as well as in the first, are covered with a white substance resembling cotton, arranged in flakes.

The remaining Aphidii have but six or eight joints in the antennæ; the last is not terminated by two setæ.

Sometimes the elytra and wings are linear, fringed with hairs, and extended horizontally on the body, which is almost cylindrical; the rostrum is very small or but little distinct. The tarsi are terminated by a vesicular joint without hooks. The antennæ consist of eight graniform joints. Such are the insects which form the genus

THRIPS, *Linnæus*.

They are extremely agile, and seem to leap rather than fly. When we irritate them beyond a certain point, they turn up the posterior extremity of their body in the manner of the Staphylini. They live on flowers, plants, and under the bark of trees. The largest species scarcely exceed one line in length.

Sometimes the elytra and wings, oval or triangular, and without a fringe of hairs along the margin, are inclined or tectiform. The rostrum is very distinct. The tarsi are terminated by two hooks, and the antennæ have but six or seven joints. Such is the genus

APHIS, *Linnæus*.

In Aphis, properly so called, the antennæ are longer than the thorax, and consist of seven joints, the third of which is elongated; the eyes are entire, and there are two horns or mammillæ at the posterior extremity of the abdomen.

Almost all Aphides live in society on trees and plants, of which they suck the juices with their trunk. The two horns observed at the posterior extremity of the abdomen in a great number of species are hollow tubes from which little globules of a transparent, honey-like fluid frequently exude, on which the ant eagerly feeds.

The wounds inflicted on the leaves or tender twigs of plants, by Aphides, cause those parts of the vegetable to assume a variety of forms, as may be

observed on the shoots of the lime tree, the leaves of gooseberry bushes, apple trees, and particularly those of the elm, poplar, and pistachio, in which they produce vesicles or excrescences enclosing colonies of Aphides, and frequently an abundant saccharine fluid. Most of these insects are covered with a farinaceous substance, or cotton-like filaments, sometimes arranged in bundles. The larvæ of the Hemerobii, those of several Diptera, and of Coccinellæ, destroy immense numbers of Aphides.

A. quercus, Lin. Brown; remarkable for its rostrum, which is at least thrice as long as the body.

A. fagi, Lin. Completely covered with white down resembling cotton.

FAMILY III.

GALLINSECTA.

In this last family there are but five joints in the tarsi, with a single hook at the extremity. The male is destitute of a rostrum, and has but two wings, which are laid horizontally on the body, one over the other; the abdomen is terminated by two setæ. The female is apterous and provided with a rostrum. The antennæ are filiform or setaceous, and most commonly composed of eleven joints.

They constitute the genus

Coccus, *Linnæus.*

The bark of various trees is frequently covered with a multitude of little oval or rounded bodies, in the form of fixed shields or scales, in which, at the first glance, no external organs indicative of an insect are perceptible. These bodies are nevertheless animals of this class and belong to the genus Coccus. Some are females, and the remainder young males, the form of both being nearly similar. An epoch, however, soon arrives in which all these individuals experience singular changes. They then become fixed; the male larvæ for a determinate period, requisite for their ultimate metamorphosis, and the females for ever. If we observe the latter in the spring, we shall find that their body gradually increases to a great volume, and finally resembles a gall-nut, being sometimes spherical, and at others reniform or scaphoid. The skin of some is smooth and level, that of the remainder presents incisures or vestiges of segments. They slip their eggs between the skin of their abdomen, and a white down which covers the spot they occupy. Their body then becomes desiccated and forms a solid crust or shell which covers their ova. Other females protect theirs by enveloping them with a white substance resembling cotton. Those which are spherical form a sort of box for them with their body. The young Cocci have an oval body, much flattened and furnished with the same organs as that of the mother. They spread themselves over the leaves, and

towards the end of autumn approach the branches, on which they place themselves to pass the winter.

The Gallinsects appear to injure trees by a superabundant sudoresis through the punctures they make in them, and of course those who cultivate the peach, orange, fig, and olive are particularly on their guard against them. Certain species fix themselves to the roots of plants. Some are valuable for the rich red colour they furnish to the art of dyeing. Further researches on these insects might teminate in the discovery of others which would prove of similar utility.

C. cacti, Lin. (The Cochineal Insect.) Female of a deep brown, covered with white dust, flat beneath, convex above, and bordered; the annuli are tolerably distinct at first. The male is of a deep red, with white wings.

This insect is cultivated at Mexico, on a species of Opuntia, and is celebrated for the crimson dye it furnishes, which, by being combined with the solution of tin in nitro-muriatic acid, produces a scarlet. It is also from this insect that we obtain carmine. It is one of the richest productions of Mexico.

ORDER VIII.

NEUROPTERA*.

The Neuroptera are distinguished from the three preceding orders by their two upper wings, which are membranous, generally naked, diaphanous, and similar to the under ones, in texture and properties. They are distinguished from the eleventh and twelfth by the number of these organs, as well as by their mouth, fitted for mastication or furnished with mandibles and true maxillæ, or in other words organised as usual, a character which also removes this order from the tenth or that of the Lepidoptera, where, besides, the four wings are farinaceous. The surface of these wings in the Neuroptera is finely reticulated, and the under ones are most commonly as large as those above them, but sometimes wider, and sometimes narrower and longer. Their maxillæ and the inferior portion of their labrum or the mentum are never tubular. The abdomen is destitute of a sting and rarely furnished with an ovipositor.

Their antennæ are usually setaceous, and composed of numerous joints. They have two or three ocelli. The trunk is formed of three segments, intimately united in a single body, distinct from the abdomen, and bearing the six legs; the first of these segments is usually very short, and in the form of a

* Nerve-winged.

collar. The number of joints in the tarsi varies. The body is usually elongated, and with rather soft or but slightly squamous teguments; the abdomen is always sessile. Many of these insects are carnivorous in their first state and in their last.

Some merely experience a semi-metamorphosis, the rest a complete one; but the larvæ always have six hooked feet, which they usually employ in seeking their food.

I will divide this order into three families, which will successively present to us the following natural affinities:

1. Carnivorous insects, subject to a semi-metamorphosis, with aquatic larvæ.
2. Carnivorous insects, subject to a complete metamorphosis, with aquatic or terrestrial larvæ.
3. Carnivorous or omnivorous terrestrial insects, subject to a semi-metamorphosis.
4. Herbivorous insects, subject to a complete metamorphosis, with aquatic larvæ, which construct portable dwellings.

We will end with those species in which the wings are the least reticulated, and which resemble Phalæna or Tineites.

FAMILY I.

SUBULICORNES*, *Latreille.*

The antennæ are subulate, and hardly longer than the head; they are composed of seven joints at most, the last of which is setaceous. The mandibles and the maxillæ are completely covered by the labrum and labium, or by the anterior and projecting extremity of the head.

The wings are always reticulated and distant, sometimes laid horizontally and sometimes placed perpendicularly; the inferior are as large as the superior, or sometimes very small and even wanting. The ordinary eyes are very large and prominent in all of them; and they all have two or three ocelli situated between the former. The two first periods of their life are passed in the bosom of the waters, where they prey on living animals.

The larvæ and pupæ, which approximate in form to the perfect insect, respire by means of peculiar organs situated on the sides or extremity of the abdomen. They issue from the water to undergo their ultimate metamorphosis.

In some the mandibles and maxillæ are corneous, very strong, and covered by the two lips; the tarsi are triarticulated; the wings are equal, and the posterior extremity of the abdomen is simply terminated by hooks or laminiform or foliaceous appendages. They form the genus

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* Awl-shaped horns.

Libellula, *Linnæus, Geoffroy,*

Or *Dragon Flies.* The light and graceful figure of these insects, the beautiful and variegated colours with which they are adorned, their large wings resembling lustrous gauze, and the velocity with which they pursue the flies, &c., that constitute their food, attract our attention and enable us to recognise them with facility. Their head is large, rounded, or in the form of a broad triangle. They have two great lateral eyes and three ocelli situated on the vertex; two antennæ, &c. The female deposits her eggs in the water.



Libellula.

The larvæ and the chrysalides inhabit the water until the period of their ultimate metamorphosis, and, with the exception of wings, are tolerably similar to the perfect insect. Their head, however, on which the simple eyes are not perceptible, is remarkable for the singular form of the piece which replaces the lower lip. It is a kind of mask that covers the mandibles, maxillæ, and almost the whole under part of the head.

Having attained the period of their ultimate metamorphosis, the nymphs issue from the water, climb along the stems of plants, fix there, and divest themselves of their skin.

Libellula, *Fabricius,*

Or Libellula proper, where the wings are extended horizontally when at rest. The head is almost globular, with very large, contiguous or closely approximated eyes, and a vesicular elevation on the vertex, with an ocellus on each side; the other, or anterior ocellus is much larger.

Æshna, *Fabricius.*

The Æshnæ resemble the Libellulæ proper in their mode of bearing their wings, and in the form of their head, but their two posterior ocelli are placed on a simple transverse elevation in the form of a carina. The intermediate lobe of the labium is also larger, and the two others are distant and armed with a very stout tooth and spiniform appendage. The abdomen is always narrow and elongated.

The abdomen is terminated by five appendages, but one of them is truncated at the end.

Æ. grandis. One of the largest species of this family, being nearly two inches and a half (French) in length; fulvous brown; two yellow lines on each side of the thorax; abdomen spotted with green or yellowish; wings iridescent. It darts with amazing rapidity over meadows, and along the shores of rivers, &c., pursuing flies in the manner of the swallow.

AGRION, *Fabricius.*

Where the wings are elevated perpendicularly when at rest, the head is transversal, and the eyes are distant.

The other Subulicornes have an entirely membranous or very soft mouth, composed of parts that are rather indistinct. Their tarsi consist of five joints; their inferior wings are much smaller than the superior, or even wanting, and their abdomen is terminated by two or three setæ.

They form the genus

EPHEMERA, *Linnæus,*

So called from their short term of life, in their perfect state. Their body is extremely soft, long, tapering, and terminated posteriorly by two or three long and articulated setæ. The antennæ are very small and composed of three joints, the last of which is very long, and in the form of a conical thread. The wings of those insects are always placed perpendicularly, or slightly inclined posteriorly, like those of an Agrion.

The Ephemera usually appear at sun-set, in fine weather, in summer and autumn, along the banks of rivers, lakes, &c., and sometimes in such innumerable hosts that after their death the surface of the ground is thickly covered with their bodies; in certain districts cart-loads of them are collected for manure. The descent of a particular species—the *albipennis*—remarkable for the shortness of its wings, recals to our minds a heavy fall of snow.

These insects (our May flies) collect in flocks in the air, flitting about and balancing themselves in the manner of the Tipulæ, with the terminal filaments of their tail divergent.

The continuation of their species is the only function these animals have to fulfil, for they take no nourishment, and frequently die on the day of their metamorphosis, or even within a few hours after that event. Those which fall into the water become food for fishes, and are styled manna by fishermen.

If however we trace them back to that period in which they existed as larvæ, we find their career to be much longer, extending from two to three years. In this state, as well as that of semi-nymphs, they live in water, frequently concealed, at least during the day, in the mud or under stones, sometimes in horizontal holes divided interiorly into two united canals, each with its proper opening. These habitations are always excavated in clay, bathed by water, which occupies its cavities: it is even supposed that the larvæ feed on this earth.

The semi-nymph only differs from the larva in the presence of the cases which enclose the wings. When the moment of their development has arrived, it leaves the water, and having changed its skin, appears under a new form—but, by a very singular exception, it has still to experience a second change of tegument.

The ultimate exuvium of these insects is frequently found on trees and walls; they sometimes even leave them on the clothes of persons who may be walking in their vicinity.

FAMILY II.

PLANIPENNES*.

This family comprises those Neuroptera in which the antennæ, always multiarculated, are much longer than the head, without being subulate or styliform. Their mandibles are very distinct; their inferior wings almost equal to the superior ones, and extended or simply folded underneath at their anterior margin.

Their wings are almost always much reticulated and naked; their maxillary palpi are usually filiform or somewhat thicker at the extremity, shorter than the head, and composed of from four to five joints.

I will divide this family into five sections, which, by reason of the habits of the insects that compose them, form as many small sub-families.

1. The Panorpatæ of Latreille, which have five joints to all the tarsi, and the anterior extremity of their head prolonged and narrowed in the form of a rostrum or proboscis.

They constitute the genus

Panorpa, *Linnæus, Fabricius,*

Where the antennæ are setaceous and inserted between the eyes; the clypeus is prolonged into a conical, corneous lamina, arched above to cover the mouth; and the mandibles, maxillæ, and labium are almost linear. They have from four to six short, filiform palpi.

Their body is elongated, the head vertical, the first segment of the trunk usually very small, in the form of a collar, and the abdomen conical or almost cylindrical.

There is much difference between the two sexes in several species. Their metamorphoses have not yet been observed.

P. communis, Lin. From seven to eight lines in length; black; rostrum and extremity of the abdomen russet; wings spotted with black.—On hedges and in woods.

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* Flat-winged.

2. The Myrmeleonides, which also have five joints in the tarsi, but their head is not prolonged anteriorly in the form of a rostrum or snout; their antennæ gradually enlarge, or have a globuliform termination.

Their head is transverse, vertical, and merely presents the ordinary eyes, which are round and prominent; there are six palpi, those of the labium usually longer than the others, and inflated at the extremity. The palate of the mouth is elevated in the form of an epiglottis; the first segment of the thorax is small; the wings are equal, elongated, and tectiform; the abdomen is most frequently long and cylindrical, with two salient appendages at its extremity in the males. The legs are short.

They are found in the warm localities of the southern countries, clinging to plants, where they remain quiescent during the day. Most of them fly well. The nymph is inactive.

These insects form the genus

Myrmeleon, *Linnæus.*

In Myrmeleon proper, the antennæ enlarge insensibly, are almost fusiform, are hooked at the extremity, and much shorter than the body; the abdomen is long and linear.

M. formicarium, Lin. About an inch long; blackish spotted with yellowish; wings diaphanous, with black nervures picked in with white; some obscure spots, and one whitish, near the extremity of the anterior margin.



The number of ants destroyed by the larva of this species, which is the most common one in Europe, has obtained for it the name of *Formica-leo, Lion-ant,* or *Fourmileon.* Its abdomen is extremely voluminous in comparison to the rest of the body. Its head is very small, flattened, and armed with two long mandibles in the form of horns, dentated on the inner side and pointed at the extremity, which act at once as pincers and suckers. Its body is greyish, or of the colour of the sand in which it lives. Although provided with six feet, it moves very slowly and almost always backwards. Thus, not being able to seize its prey by the celerity of its motions, it has recourse to stratagem; and lays a trap for it in a funnel-shaped cavity which it excavates in the finest sand, at the foot of a tree, old walls, or acclivities exposed to the south. It arrives at the intended scene of its operations by forming a ditch, and traces the area of the funnel, the size of which is in proportion to its growth. Then, always moving backwards, and describing as it goes, spiral convolutions, the diameter of which progressively diminishes, it loads its head with sand by means of one of its anterior feet, and jerks it to a distance. In this manner, and sometimes in the space of half an hour, it will remove a reversed cone of sand, the base of which is equal in diameter to that of the area, and the height to about three-fourths of the same. Hidden and quiescent at the bottom of its retreat, with nothing visible but its mandibles, it awaits with patience till an insect is precipitated into it; if it endeavour to escape, or be at too great a distance for it to seize, it showers

upon it such a torrent of sand by means of its head and mandibles, as propels it stunned and defenceless to the bottom of the hole. Having exhausted its juices by suction, it jerks away the carcass.

When about to pass into the state of a chrysalis, it encloses itself in a perfectly round cocoon, formed of a silky substance of the colour of satin, which it covers externally with grains of sand.

There is a genus separated from it by Fabricius called *Ascalaphus*.

3. The Hemerobini of Latreille, which are similar to the Myrmeleonides in the general form of their body and wings; but their antennæ are filiform, and they have but four palpi.

They form the genus

Hemerobius, *Linnæus, Fabricius.*

The body of the true Hemerobii is soft, and the globular eyes are frequently ornamented with metallic colours; the wings are large, and their exterior border is widened. They fly slowly and heavily; several diffuse a strong odour, with which the finger that has touched them remains for a long time impregnated.

The female deposits ten or twelve eggs on leaves; they are oval, white, and secured by a very long and capillary pedicle. Some authors have mistaken them for a species of mushroom. The larvæ bear a considerable resemblance to those of the preceding division; they are, however, more elongated and errant. Réaumur calls them *Leons des Pucerons*, because they feed on Aphides. They seize them with their horn-like mandibles, and soon exhaust them by suction. Some form a thick case for themselves of their remains, which gives them a very singular appearance. The nymph is enclosed in a silken cocoon of an extremely close tissue, the volume of which is very small when compared with that of the insect. The fusi of the larvæ are situated at the posterior extremity of the abdomen, like those of the larvæ of the Myrmeleonides.

H. perla, Lin. Green-yellow; eyes golden; wings transparent with entirely green nervures.

In others the first segment of the thorax is large, and the wings are laid horizontally on the body; the palpi are filiform, and the last joint is conical or almost cylindrical, and frequently shorter than the preceding one. The larvæ are aquatic. They form the genus

Semblis, *Fabricius,*

Which is composed of three subgenera, viz. *Corydalis, Chauliodes,* and *Sialis.*

4. A fourth division, that of the Termitinæ, will comprise Neuroptera subject to a semi-metamorphosis. They are all terrestrial, active, carnivorous, or gnawers, in all their states. With the exception of the Mantispæ, very distinct from all the insects of this order, by the form of their anterior legs, which resemble those of a Mantis; the tarsi consist of four joints at most, which removes them from the preceding genera of the same family. The mandibles

are always corneous and strong. The inferior wings are nearly as large as the superior ones, and without folds, or smaller.

Mantispa, *Illiger*,

Where there are five joints to all the tarsi, and the two first legs are formed like those of a Mantis or adapted for prehension. The antennæ of these insects are very short and granose, and their eyes large. The prothorax is very long, and thickened anteriorly, and the wings are tectiform.

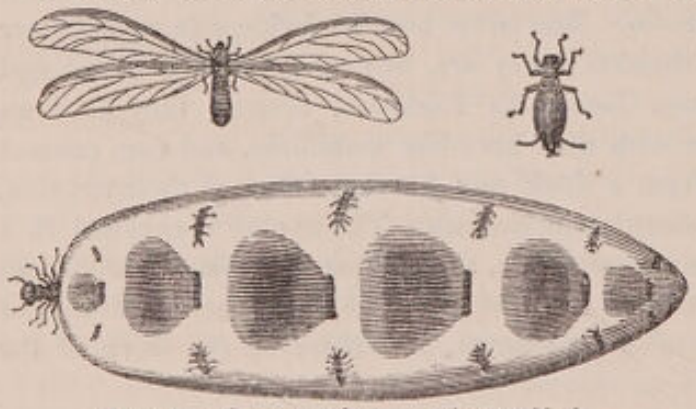
Rhaphidia, *Linnæus, Fabricius*,

Where the tarsi are composed of four joints and the wings are tectiform. The head is elongated and narrowed posteriorly, the thorax long, narrow, and almost cylindrical. The abdomen of the female terminates by a long external oviduct, formed of two laminæ.

Termes, Hemerobius, *Linnæus*,

Where all the tarsi are likewise composed of four joints; but the wings are very long, and laid horizontally on the body; the head is rounded, and the thorax almost square or semicircular.

The body of these insects is depressed, and their antennæ are short and formed like a chaplet. The mouth is almost similar to that of the Orthoptera, and the labium is quadrifid. They have three ocelli, one of which, on the forehead, is indistinct; the two others are situated, one on each side, near the inner margin of the ordinary eyes. Their wings are commonly somewhat diaphanous, coloured, furnished with extremely fine and crowded nervures, and not very distinctly reticulated. Their abdomen has two small, conical, biarticulated points at the extremity; the legs are short.



Termites, the natural size, and magnified.

The Termites, peculiar to the countries situated between the tropics, or to those which are adjacent, are known by the name of *White Ants, Poux de bois, Caria*, &c. The appalling destruction caused by these insects, particularly in the state of larvæ, in those parts of the world, is but too well known. These larvæ, the *working Termites* or *labourers*, bear a close resemblance to the perfect insect; but their body is softer and apterous, and their head, which appears proportionally larger, is usually destitute of eyes, or has but very small ones. They live in society, and form communities, so numerous as to defy all calculation, which live under cover in the ground, trees, and all sort of ligneous articles, such as tables, chairs, furniture of all kinds, and the planks, timbers, &c. &c. which form parts of houses. There they excavate galleries, which

form so many roads, all leading to the centre of their domicil, and these bodies thus mined, and retaining nothing but a superficial bark or covering, soon crumble into dust. If compelled by any insurmountable obstacle to leave their dwellings, they construct tubes or ways which still keep them from sight. The nests or domicils of several species are exterior, but have no visible opening. Sometimes they are raised above the surface of the ground, in the form of pyramids or turrets, occasionally surmounted with a capital or very solid roof, which, by their height and number, resemble a little village. Sometimes they form a large globular mass on the branches of trees. Another sort of individuals, the *neuters*, also called *soldiers*, defend the domicil. They are distinguished by their stouter and more elongated head, the mandibles of which are also longer, narrower, and considerably crossed. They are much less numerous than the others, and remain near the surface of the habitation, are the first that present themselves in case of an attack, and pinch with considerable strength. It is also said that they force the *labourers* to work. The semi-nymphs have rudiments of wings, and in other respects resemble the larvæ.

Having become perfect insects, the Termites leave their original retreat, and fly off at evening or during the night in incalculable numbers. At sunrise, they lose their wings, which are dried up, fall to the ground, and are mostly devoured by birds, lizards, and the rest of their enemies.

In the remaining Termetinæ the tarsi are biarticulated, and the labial palpi indistinct and very short. The antennæ consist of about ten joints, the first segment of the trunk is very small, and the inferior wings are smaller than the others. They form the genus

Psocus, *Latreille, Fabricius,*

And are very small insects with a short and extremely soft body that is frequently inflated, or as if hump-backed. Their head is large, their antennæ setaceous, and the maxillary palpi salient. Their wings are tectiform and but slightly reticulated or simply veined. They are extremely active, and live under the bark of trees, in wood, &c. The following species is commonly found in books and collections of insects and plants.

P. pulsatorius. Usually apterous; yellowish white; eyes and some small spots on the abdomen, russet. It was thought to produce that faint noise resembling the tick of a watch frequently heard in our houses, and of which we have spoken while on the genus Anobium—thence the origin of its specific name.

Dr. Leach separated the genus Atropus from Psocus from the circumstance of the tarsi being three-jointed, and the wings wanting. The type of the genus is the *Termes pulsatorium* of Linnæus, a minute insect, commonly met with amongst old books, and upon the paper on walls. It is of a dirty white colour, with the eyes and a row of spots long the abdomen reddish. Its specific name alludes to the noise which it makes, similar to the ticking of a watch, and which has been superstitiously said to precede death.



5. The PERLIDES, in which the tarsi are triarticulated, and the mandibles almost always partly membranous and small. The inferior wings are wider than the others, and doubled at their inner margin.

They comprise the genus

PERLA, *Geoffroy.*

Their body is elongated, narrow, and flattened; the head is tolerably large, the antennæ are setaceous, and the maxillary palpi very salient. The first segment of their trunk is nearly square, and the wings are crossed and laid horizontally on the body; the abdomen terminates as usual by two articulated setæ.

Their larvæ are aquatic and inhabit sheaths or cases, which they construct in the manner of those formed by the insects of the ensuing family, and in which they pass into the state of nymphs.

FAMILY III.

PLICIPENNES*.

IN this family the mandibles are wanting, and the inferior wings are usually wider than the others, and plaited longitudinally. It is formed of the genus

PHRYGANEA, *Linnæus, Fabricius.*

These Neuroptera, at a first glance, have the appearance of little Phalænæ, and hence the name of *Mouches papillonacées* or papilionaceous flies, bestowed upon them by Réaumur. The body is most frequently bristled with hairs, and, with the wings, forms an elongated triangle, like several of the Noctuæ and Pyrales. The first segment of the thorax is small. The wings are simply veined, usually coloured, or almost opaque, silky or pilose in several, and always strongly tectiform. The legs are elongated, are furnished with small spines, and have five joints in all the tarsi.

These insects chiefly fly at night or during the evening, diffuse a disagreeable odour, frequently penetrate into houses, where they are attracted by the light, and are extremely quick and agile in all their motions. The smaller species flit about in flocks over ponds and rivers.

Their larvæ, always like the Tineæ, inhabit tubes that are usually cylindrical, covered with various substances which they find in the water, such as blades of grass, bits of reeds, leaves, roots, seeds, grains of sand, and even little shells, and frequently arranged symmetrically. They connect these various bodies with silken threads, the source of which is contained in internal

* Folded-wings.

reservoirs similar to those of caterpillars, and that are also produced by fusi situated in the lip. The interior of the habitation forms a tube which is open at both ends for the intromission of water. The larva always transports its domicile along with it, protrudes the anterior extremity of its body while progressing, never quits its dwelling, and when found to do so, returns to it voluntarily when left within its reach.

When about to become nymphs, they fix their tubes to different bodies, but always in water, and close the two orifices with a grating, the form of which, as well as that of the tube itself, varies according to the species. In fixing their portable dwelling, they so manage it that the aperture, which is at the point d'appui, is never obstructed.

The nymph is furnished anteriorly with two hooks, which cross each other and somewhat resemble a rostrum or snout. With it, when the period of its last metamorphosis has arrived, it perforates one of the grated septa in order to procure egress.

Hitherto immoveable, it now walks or swims with agility, by means of its four anterior feet, which are free, and furnished with thick fringes of hairs. The nymphs of the large species leave the water altogether, and climb on various bodies, where their final change is effected. The small ones simply rise to the surface, where they are transformed to winged insects, in the manner of the Culices and various Tipulariæ; their exuvium serves them for a boat.

There are several subgenera.

ORDER IX.

HYMENOPTERA *.

In this family we still find four membranous and naked wings, and a mouth composed of mandibles, maxillæ and two lips; but these wings, of which the superior are always largest, have fewer nervures than those of the Neuroptera, and are not veined; the abdomen of the females is terminated by an ovipositor or sting.

Besides their compound eyes they are all provided with three ocelli. Their antennæ vary, not only according to the genus, but even in the sexes of the same species; generally, however, they are filiform or setaceous. The maxillæ and labium are usually narrow, elongated, and fixed in a deep cavity of the head by long muscles, form a semitube inferiorly, are frequently folded up at their extremity, and better adapted for the transmission of nutritious fluids than for mastication; in several they form a proboscis. The ligula is mem-

* Membrane-winged.

branous, either widened at its extremity, or long and filiform, having the pharynx at its anterior base, and being frequently covered by a sort of sub-labrum or epipharynx. They have four palpi; two maxillary and two labial. The thorax consists of three united segments, of which the anterior is very short and the two last are confounded in one. The wings are laid horizontally on the body. The abdomen is most commonly suspended by a little thread or pedicle to the posterior extremity of the thorax. The tarsi consist of five entire joints, none of them being divided. The ovipositor and sting are generally composed of three long and slender pieces, two of which serve as a sheath to the third in those which are provided with an ovipositor, and one alone, the superior, has a groove underneath for lodging the two others. In those where this ovipositor is transformed into a sting, this offensive weapon and the oviduct are serrated at the extremity.

The Hymenoptera undergo a complete metamorphosis. Most of their larvæ resemble worms and are destitute of feet; such, for instance, are those of our second and following families. Those of the first have six hooked feet, and frequently from twelve to sixteen others that are simply membranous. These latter have been named pseudo-caterpillars. Both kinds have a squamous head provided with mandibles, maxillæ, and a lip; at the extremity of the latter is a fusus for the transmission of the silky material that is to be employed in constructing the cocoon of the nymph.

Some feed on vegetable substances, while others, always destitute of feet, devour the carcasses of insects, together with their larvæ, nymphs, and even eggs.

To remedy their want of locomotive powers, the mother furnishes them with provisions, sometimes by transporting aliment into the nests she has prepared for them, which are frequently constructed with so much art as to excite our wonder and surprise, and sometimes by depositing her eggs in the body of the larvæ and nymphs of insects, on which her progeny are to feed.

Other larvæ of Hymenoptera, also destitute of feet, require more elaborated and frequently renewed supplies of aliment, both vegetable and animal. These are reared in common by neuters forming communities, of which they have the sole care; their labours and mode of life will always continue to excite our admiration and astonishment.

Almost all Hymenopterous insects, in their perfect state, live on flowers, and are usually most abundant in southern climates. Their period of life, from their birth to their ultimate metamorphosis, is limited to a year.

I will divide this order into two sections.

The first, or that of the TEREBRANTIA, is characterised by the presence of an ovipositor in the females.

I divide this section into two great families.

FAMILY I.

SECURIFERA*.

Our first family is distinguished from the following ones by a sessile abdomen, or the base of which is joined to the thorax throughout its whole thickness, that seems to be a continuation of it, and to have no separate motion.

The females are provided with an ovipositor that is most commonly serrated, and which not only enables them to deposit their eggs, but likewise to prepare a place for their reception. The larvæ always have six squamous feet, and frequently others that are membranous.

This family is composed of two tribes.

In the first, that of the Tenthredinetæ, vulgarly termed *Saw-flies*, we observe elongated and compressed mandibles; a trifid or sort of digitated ligula; an ovipositor formed of two serrated, pointed blades, united and lodged in a groove under the anus. The maxillary palpi are all composed of six joints, and the labials of four; the latter are always the shortest. The wings are always divided into numerous cells. This tribe forms the genus

Tenthredo, *Linnæus.*

The cylindrical abdomen of these insects which is rounded posteriorly, composed of nine annuli, and so closely joined to the thorax that the two seem to be continuous; the ragged appearance of their wings; the two little rounded, granular, and usually coloured bodies situated behind the scutellum, together with their heavy port, cause them to be easily recognised. The abdomen of the female presents at its inferior extremity a double, moveable, squamous ovipositor that is serrated, pointed, and lodged between two concave laminæ, forming its sheath or case.

It is by the alternate action of the teeth of this ovipositor, that the insect makes a number of little holes in the branches, and various other parts of trees and plants, in each of which it first deposits an egg, and then a foaming liquid, the use of which, it is presumed, is to prevent the aperture from closing. The wounds made in this way become more and more convex by the increasing size of the egg. Sometimes these excrescences assume the form of a nut-gall, either ligneous or soft and pulpy, or resemble a little fruit, according to the nature of the parts of the plants that are affected by them. These tumours then form the domicile of the larvæ which inhabit them either solitarily or in societies. There they undergo their metamorphosis, and issue from them

* Hatchet bearers.

through a circular opening made in their parietes by the teeth of the insect. Generally speaking, however, these larvæ live exposed on the leaves of the trees and plants on which they feed.

T. scrophulariæ, Lin. Five lines in length; black; antennæ fulvous and somewhat thickest at the extremity; annuli of the abdomen, the second and third excepted, margined posteriorly with yellow; tibiæ and tarsi fulvous. It resembles a wasp.

The larva has twenty-two feet; white, with black head and points. It feeds on the leaves of the scrophulariæ.

There are various subgenera belonging to this tribe, such as *Cimbex*, *Hylotoma*, &c.

The second tribe, that of the UROCERATA, Lat., is distinguished from the preceding one by the following characters: the mandibles are short and thick; the ligula is entire; the ovipositor of the females is somewhat salient and composed of three threads, and sometimes capillary and spirally convulated in the interior of the abdomen.

This tribe is composed of the genus

SIREX, *Linnæus*,

The antennæ of which are filiform or setaceous, vibratile, and formed by from ten to twenty-five joints. The head is rounded and almost globular; the labrum very small; the maxillary palpi are filiform with from two to five joints, and the labials with three, the last of which is the thickest. The body is almost cylindrical. The anterior or posterior tarsi, and in several the colour of the abdomen, differs according to the sex. The female deposits her eggs in old trees, most commonly in pines. Her ovipositor is lodged at the base between two valves, forming a groove.

In Sirex proper, the antennæ are inserted near the front and consist of from thirteen to twenty-five joints. The extremity of the last segment of the abdomen is prolonged into a sort of tail or horn, and the ovipositor is salient and formed of three filaments.

These insects, which are tolerably large, more particularly inhabit the pine forests of cold and mountainous countries, produce in flying a humming like that of a Bombus, &c.; and in certain seasons have appeared in such numbers as to strike the people with terror. The larva has six feet, and the posterior extremity of the body terminates in a point. It lives in wood, where it spins a cocoon, and completes its metamorphosis.

The *Tremex*, Jurine, only differs from Sirex in having the antennæ shorter, less slender at the end, and consisting of thirteen or fourteen joints.

FAMILY II.

PUPIVORA*.

In the second family of the Hymenoptera we find the abdomen attached to the thorax by a simple portion of its transversal diameter, and even most frequently by a very small thread or pedicle, in such a manner that its insertion is very distinct, and that it moves on that part of the body. The females are provided with an ovipositor.

The larvæ are destitute of feet and mostly parasitical and carnivorous.

I divide this family into six tribes.

In the first, that of the Evaniales, Lat., the wings are veined, and the superior ones, at least, are lobate; the antennæ filiform or setaceous, and composed of thirteen or fourteen joints; the mandibles dentated on the inner side; the maxillary palpi composed of six joints, and the labials of four. The abdomen is implanted on the thorax, in several under the scutellum, and has an ovipositor usually salient and formed of three filaments.

This tribe appears to form but the single genus

Fœnus.

Sometimes the ovipositor is concealed, or but very slightly salient, and resembles a little sting. The ligula is trifid, a character which approximates these insects to the preceding Hymenoptera.

In the second tribe, that of the Ichneumonides, the wings are also veined, the superior ones always presenting complete or closed cells in their disk. The abdomen originates between the two posterior legs. The antennæ are generally filiform or setaceous, rarely clavate, vibratile, and multiarticulated, being composed of sixteen joints at least. In most of them the mandibles have no tooth on the inner side, and terminate in a bifid point. The maxillary palpi, always apparent or salient, consist most commonly of but five joints. The ovipositor is formed of three threads.

This tribe embraces almost the whole genus

Ichneumon, *Linnæus*†.

These insects destroy the posterity of the Lepidoptera, so noxious to the agriculturist under the form of caterpillars, just as the quadruped so called is said to destroy that of the crocodile by breaking its eggs, and even by introducing itself into the body of the animal in order to devour its entrails.

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* Pupæ-eaters.

† This genus comprises *upwards of twelve hundred species*, and its study is extremely difficult.

Some authors have called them *Mouches tripiles*, on account of the three setæ which compose their ovipositor, and *Mouches vibrantes*, because their antennæ are continually vibrating. These organs are frequently curled (contournées), and have a white or yellowish annular spot in the middle. The body is most frequently narrow and elongated or linear, with the ovipositor sometimes exterior and resembling a tail, and sometimes very short, and concealed in the interior of the abdomen, which then terminates in a point, whilst in those where the ovipositor is salient, it is thicker, and as if clavate and truncated posteriorly. Of the three pieces which compose this instrument the intermediate is the only one that penetrates into the bodies in which these insects deposit their eggs; its extremity is flattened, and sometimes resembles the nib of a pen.



The females, anxious to lay, are continually flying or walking about, in order to discover the larvæ, nymphs, and eggs of insects, and even spiders, aphides, &c., destined to receive their ova, and when hatched, to sustain their offspring. In this search they exhibit a wonderful degree of instinct, which reveals to them the most secret retreats of these objects. Those which are provided with a long ovipositor deposit the germs of their race in the fissures or holes of trees, or under their bark. In this operation the ovipositor proper is introduced almost perpendicularly, and is completely disengaged from its semi-scabbards, which remain parallel to each other, and supported in the air, in the line of the body. Those females in which the ovipositor is very short, and but slightly or not at all apparent, deposit their ova in the body of larvæ, caterpillars, and nymphs, which are exposed or very accessible.

The larvæ of the Ichneumonidæ, like all the others of the succeeding families, are destitute of feet. Those which, in the manner of intestinal worms, inhabit the bodies of larvæ or caterpillars, where they sometimes form communities, only attack the adipose substance—corps graisseux—or such of the internal parts as are not necessary to their existence. When about to become nymphs, however, they perforate their skin in order to open a passage, or put them to death, and there tranquilly undergo their ultimate metamorphosis. Such also are the habits of those which feed on nymphs or chrysalides. Nearly all of them spin a silken cocoon, in which they become nymphs. These cocoons are sometimes agglomerated, either naked, or enveloped in a sort of tow or cotton, in an oval mass, frequently found attached to the stems of plants. The symmetrical arrangement of the cocoons of one species forms an alveolar body, resembling the honeycomb of our domestic bee. The silk of these cocoons is sometimes of a uniform yellow or white, and sometimes mixed with black or filaments of two colours. Those of some species are suspended to a leaf or twig, by means of a long thread.

There are various subgenera belonging to this tribe.

In the second tribe, the GALLICOLÆ, we find but a single nervure in the inferior wings. The antennæ are of equal thickness throughout, or gradually

enlarge, but without forming a club, and consist of from thirteen to fifteen joints. The palpi are very long. The ovipositor is convoluted spirally in the interior of the abdomen, and has its posterior extremity lodged in a groove of the venter.

The Gallicolæ form the genus

Cynips, *Linnæus.*

These insects seem to be hump-backed, having a small head and a thick and elevated thorax. Their abdomen is compressed, carinated, or trenchant inferiorly, and truncated obliquely, or obtuse, at the extremity. That of the female contains an ovipositor, which seems to consist of a single, long, and extremely slender or capillary thread convoluted spirally near the base or towards the origin of the venter, and of which the terminal portion is lodged under the extremity between two elongated valvulæ; each of which forms a semi-scabbard or sheath for it. The extremity of this ovipositor is grooved, and has lateral teeth resembling the barbs on the head of an arrow; with these the insect widens the aperture it has effected in different parts of plants for the purpose of receiving its eggs. The juices of those plants are diffused in the wounded spots and form excrescences or tumours called *galls*. The one most commonly known, or the *gall-nut*, *Aleppo-gall*, is employed, with a solution of the sulphate of iron, to produce a black dye. The form and solidity of these protuberances vary according to the nature of the parts of the plants that have been wounded, such as the leaves, petioles, buds, bark, roots, &c. Most of them are spherical; some resemble fruits. Others are fibrous or hairy, like that called the *bedeguar*, *mousse chevelue*, &c., which is observed on the wild rose-trees. Some of them resemble artichokes, others mushrooms, &c. &c. The eggs enclosed in these excrescences increase in size and consistence, and finally produce larvæ destitute of feet, but frequently provided with mammillæ in place of them. Sometimes they live there solitarily, and sometimes in society, feeding on their internal parietes without interfering with their development, and remaining five or six months in this condition. There also some undergo their metamorphosis, to effect which others issue forth and descend into the earth where they remain till their final change is completed. The round holes observed on the exterior of the gall intimate the exit of the insect. Several insects of the following family are also sometimes found in it, but this has been by destroying the natural inhabitants, of whose domicile they have taken possession, in the manner of the Ichneumonidæ.

Certain species are apterous. One species deposits its ova in the pollen of the earliest of the wild fig-trees. The modern Greeks, in pursuance of a method transmitted to them from antiquity, pierce several of these figs, and place them on their late bearing trees of the same genus; the Cynips soon leave their old dwelling and come out loaded with the fecundating dust, insinuate themselves into the eye of the fruit borne by the latter, fecundate its seeds, and accelerate the period of its maturity. This operation is termed caprification.

C. gallæ tinctoriæ. Very pale fulvous; covered with a silky and whitish down, with a blackish-brown and glossy spot on the abdomen. In the round, hard, and tuberculous gall found on a species of oak in the Levant, which is employed in commerce. By breaking this gall we may frequently obtain the perfect insect.

The fourth tribe, that of the CHALCIDIÆ, Spin., only differs essentially from the preceding one in the antennæ, which are geniculate, those of the Euchares alone excepted, and which, from the elbow, form an elongated or fusiform club, of which the first joint is frequently lodged in a groove. The palpi are very short. The number of joints of the antennæ never exceeds twelve.

We may refer the various genera established in this tribe to the genus

CHALCIS, *Fabricius.*

These insects are very small, and are decorated with extremely brilliant metallic colours. Most of them enjoy the faculty of leaping. The ovipositor, like that of the ichneumons, is salient and frequently composed of three threads; the larvæ are also parasitical. Some of them, on account of their extreme minuteness, live in the interior of the almost imperceptible ova of insects. Others inhabit galls and the chrysalides of the Lepidoptera. I suspect that they do not spin a cocoon.

There are various subgenera.

In the fifth tribe, that of the OXIURI, Lat., we observe species similar to the preceding in the absence of nervures in the inferior wings, and in which the abdomen of the females is terminated by a tubular and conical ovipositor, sometimes internal, exertile, and protruding like a sting, and sometimes external and forming a sort of tail or terminal point. The antennæ are composed of from ten to fifteen joints, and are either filiform or somewhat largest near the end, or clavate, in the females. The maxillary palpi of several are long and pendent.

We reduce the various genera of which it is composed to one, the

BETHYLUS, *Latreille, Fabricius.*

The habit of these insects are probably those of the Chalcidiæ; but as most of them are found on the sand or low plants, I suspect that their larvæ live in the ground.

In the sixth tribe, or the CHRYSIDES, Lat., the inferior wings, as in the three preceding tribes, are not veined; but their ovipositor is formed by the last rings of the abdomen in the manner of the tubes of a spy-glass, and terminates in a little sting. The abdomen, which in the female appears to consist of but three or four rings, is concave or flat beneath, and can be flexed on the pectus, in which state the insect is globular.

This tribe comprises the genus

CHRYSIS, *Linnæus.*

The lustre and richness of the colours which decorate these insects may challenge a comparison with those of the Humming-birds, and have entitled

them to the common appellation of *Golden Wasps*, or *Guêpes dorées*. They are seen walking about in a continued state of agitation, and with hasty motions, on walls and fences, exposed to the burning ardour of the sun. They are also found on flowers. Their body is elongated and covered with a firm tegument. Their antennæ are filiform, geniculate, vibratile, and composed of thirteen joints in both sexes. The mandibles are narrow, arcuated, and pointed. The ligula is most frequently emarginated. The thorax is semi-cylindrical, and presents several sutures or impressed and transverse lines. The abdomen of the greater number forms a semi-oval, truncated at base, and at the first glance seems suspended to the thorax by its whole width; the last ring is frequently marked by large punctures and terminates by dentations.

The Chrysides deposit their ova in the nests of the solitary Mason Bees, or in those of other Hymenoptera. Their larvæ devour those of the latter.

This genus now forms several subgenera, such as *Parnopes*, *Stilbum*, *Elampus*, &c.

The second section of the Hymenoptera, that of the ACULEATA, differs from the first in the absence of the ovipositor. A concealed and retractile sting, composed of three pieces, usually supplies the place of it in the females, and in the neuters of species which form communities. Sometimes, as in certain ants, the sting is wanting, and the insect defends itself by the ejaculation of an acid liquid contained in special glandular reservoirs.

The Hymenoptera of this section always have their antennæ simple, and composed of a constant number of joints, namely, of thirteen in the males, and twelve in the females. The palpi are generally filiform, those of the maxillæ, frequently the longest, having six joints, and those of the labium four. The mandibles are smaller, and frequently less dentated in the males than in the opposite sex. The abdomen, united to the thorax by a thread or pedicle, is composed of seven rings in the males, and of six in the females. The four wings are always veined.

The larvæ are always destitute of feet, and feed on aliments presented to them by the females or neuters, consisting either of the bodies of insects, the juices of fruits, or a mixture of pollen, stamina, and honey.

This section is divided into four families.

FAMILY I.

HETEROGYNA *.

THE first family of our second section is composed of two or three kinds of individuals, the most common of which, the neuters and females, are apterous, and but rarely furnished with very distinct ocelli.

* Those in which the females differ from the males or are heterogynous.

Their antennæ are always geniculate, and the ligula is small, rounded and concave, or cochleariform.

Some form communities in which we find three kinds of individuals, of which the males and females are winged, and the neuters apterous. In the two last the antennæ gradually enlarge, and the length of their first joint is at least equal to that of the third of the whole organ; the second is almost as long as the third, and has the form of a reversed cone. The labrum of the neuters is large, corneous, and falls perpendicularly under the mandibles.

These Hymenoptera compose the genus

Formica, *Linnæus*,

Or that of the Ants, so highly celebrated for their foresight, and so well known, some by their depredations in our houses, where they attack our sugar and preserved viands, communicating to them at the same time a musky and disagreeable odour, and others by the injury they do to our trees, by gnawing their interior in order to form domiciles for their colonies.

The abdominal pedicle of these insects is in the form of a scale or knot, either double or single, a character by which they are easily recognised. Their antennæ are geniculate, and usually somewhat largest near the extremity; the head is triangular, with oval or rounded and entire eyes, and the clypeus large; the mandibles are very strong in the greater number, but vary greatly as to form in the neuters; the maxillæ and labium are small; the palpi are filiform, and those of the maxillæ the longest; the thorax is compressed laterally, and the almost ovoidal abdomen furnished, in the females and neuters, sometimes with a sting, and sometimes with glands that secrete a particular acid called *formic*.

They form communities which are frequently extremely numerous. Each species consists of three kinds of individuals: *males* and *females* which are furnished with long wings, less veined than those of the other Hymenoptera of this section, and very deciduous; and *neuters*, destitute of wings, which are merely females with imperfect ovaries. The males and females are merely found within the domicile in transitu. They leave it the moment their wings are developed. The females wander to a distance from their birthplace, and having detached their wings by means of their feet, found a new colony. Some of those however which are in the vicinity of the ant-hills are arrested by the neuters, who force them to return to their domicile, tear off their wings, prevent them from leaving it, and force them to deposit their eggs there—it is thought, however, that they are violently expelled the moment that operation is effected.

The *neuters*, which are distinct, not only by the want of wings and ocelli, but also by the size of their head, the strength of their mandibles, their more compressed and frequently knotted thorax, and their proportionally longer legs, have the sole charge of all the economy of the habitation, and the rearing of the young. The nature and form of their nests or ant-hills vary according to the particular instinct of the species. They usually establish it in the ground; in

its construction some only employ particles of earth, and almost entirely conceal it; others seize on fragments of various bodies and with them raise conical or dome-like hillocks over the spot in which they are domiciliated. Some establish their dwelling in the trunks of old trees, the interior of which they perforate in every direction in the manner of a labyrinth, in which the detached particles are also employed. Various and apparently irregular galleries lead to the particular residence of their young.

The neuters roam abroad in search of provisions, appear to communicate to each other the success of their labours by the senses of touch and smell, and to aid and assist each other. Fruit, insects, or their larvæ, dead bodies of small quadrupeds and birds, &c., constitute their food. They feed the larvæ with their mouths, transport them in fine weather to the external superficies of the hill, in order that they may receive additional warmth, and take them down again on the approach of night or bad weather, defend them from their enemies, and look to their preservation with the greatest fidelity, particularly when the hill is disturbed. They pay equal attention to the nymphs, some of which are enclosed in a cocoon, and the others naked; they tear open the envelope of the former when the moment of their ultimate metamorphosis has arrived. The name of *eggs* is vulgarly applied to the larvæ and nymphs.

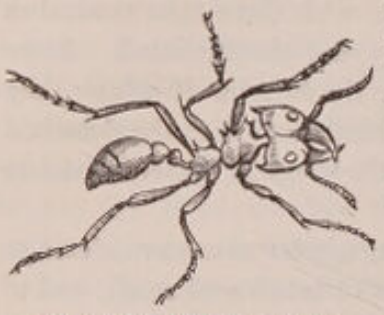
Most ant-hills are wholly composed of individuals of the same species. Nature, however, has deviated from this plan with respect to the *F. roussatre* or Amazon-ant, and that which I have called the *sanguinea*. Their neuters, by open violence, procure auxiliaries of their own caste, but of different species, which I have designated by the names of *noir-cendrée* and *mineuse*. When the heat of the day begins to lessen, and exactly at the same hour, at least for several days, the amazons or legionaries quit their nest, advance in a solid column, more or less numerous or according to the extent of the population, and march upon the ant-hill they wish to attack. They soon penetrate into it notwithstanding the opposition of the inhabitants, seize the larvæ and nymphs of the neuters peculiar to the invaded community, and transport them in the same warlike order to their own domicile, where they are attended to in common with the posterity of their conquerors, by other neuters of their own species in a perfect state, that have either been metamorphosed there, or torn from their original dwelling. Such is the composition of the mixed ant-hills.

It is well known that the ant is extravagantly fond of a saccharine liquid that exudes from the bodies of the Aphides and Gallinsects. Four or five species convey both these aphides and their eggs, particularly in bad weather, to the bottom of their nests, and even fight for the right of possession. Some construct little galleries of earth, leading from the ant-hill, which extend throughout the entire length of trees to the very branches that are loaded with these insects.

Both males and females perish towards the close of autumn, or on the first approach of winter. The labourers pass the winter in their hill in a torpid state.

This great genus is now divided into various subgenera. The Atta,

of Fabricius, differs from the ants by their very minute palpi, and by the large size of the heads of the neuters. In this genus is included some of the largest species of ants, some of them exceeding an inch in the length of the body. The *Formica cephalotes* of Linnæus and Fabricius is the type of this genus: it inhabits various parts of South America, where from its habits it has received the name of the visiting-ant, "la fourmi de visite," since it occasionally finds its way in troops into the houses of the residents, who open their doors and receive it gladly, as it consumes or drives away not only the cockroaches and spiders, but even mice and rats.



Magnified Atta Cephalotes.

The remaining Heterogyna are solitary insects. Each species is composed of but two kinds of individuals, *winged males* and *apterous females*; the latter are always armed with a powerful sting. The antennæ are filiform or setaceous, and vibratile; their first and third joints are elongated, and the length of the first is never equal to the third of the total length of the whole organ.

They form the genus

Mutilla, *Linnæus.*

These insects are found in hot and sandy localities. The female runs with great quickness, and is always seen on the ground. The males frequently alight on flowers, but their mode of life is unknown.

FAMILY II.

FOSSORES*.

The second family of this section comprises those Hymenoptera armed with a sting, in which all the individuals of both sexes are furnished with wings, and live solitarily; and in which the legs are exclusively adapted for walking, and in several for digging. The ligula is always more or less widened at its extremity, and never filiform or setaceous. The wings are always extended.

They compose the genus

Sphex, *Linnæus.*

Most females of this genus place beside their eggs, in the nests they have constructed, most commonly in the earth or in wood, various insects or their larvæ, and sometimes Arachnides, previously pierced with their sting, to serve as food for their young. The larvæ are always destitute of feet, resemble little worms, and undergo a metamorphosis in the cocoon they have spun pre-

* Diggers.

vious to becoming nymphs. The perfect insect is usually very active, and lives on flowers. The maxillæ and lip are elongated and in the form of a proboscis in many.

The numerous subgenera derived from the great genus Sphex, are now distributed into seven principal sections, viz. the *Scolietæ, Sapigytes, Sphegides, Bembecides, Larrates, Nyssones,* and *Crabronites.*

FAMILY III.

DILOPTERA.

The third family of the Aculeata is the only one of that section in which, with but few exceptions, we find the superior *wings folded* longitudinally. The antennæ are usually geniculate and clavate, or thickest at the end. The eyes are emarginated. The prothorax is prolonged behind, on each side, to the origin of the wings. The body is glabrous or nearly so, and black, more or less maculated with yellow or fulvous.

Many of these insects form temporary communities composed of three sorts of individuals, males, females, and neuters. Such of the females as survive the severity of the winter commence the nest and take care of the larvæ. They are subsequently assisted by the neuters. We will divide the Diloptera into two tribes. The type of the first, that of the Masarides, Latreille, is the genus

Masaris, *Fabricius.*

The antennæ at the first glance seem to be composed of but eight joints, the eighth, with the following ones, forming an almost indistinctly articulated club, rounded or very obtuse at the end. The ligula is terminated by two threads which can be withdrawn into a tube formed by its base. There are but two complete cubital cells in the superior wings. The middle of the anterior margin of the clypeus is emarginated and receives the labrum in the notch.

The second tribe of the Diloptera, that of the Vespariæ, is composed of the genus

Vespa, *Linnæus,*

Where the antennæ always present thirteen distinct joints in the males, and terminate in an elongated, pointed, and sometimes—in the males—hooked extremity: they are always geniculate, at least in the females and neuters. The ligula is sometimes divided into four plumose filaments, and sometimes bilobate with four glandular points at the end, one on each lateral lobe, and the remaining two on the intermediate one, which is larger, widened, and emarginated or bifid at its extremity. The mandibles are strong and dentated. The clypeus is large. The females and neuters are armed with an extremely

powerful and venomous sting. Several of them form communities composed of the three sorts of individuals.

The larvæ are vermiform, destitute of feet, and enclosed separately in a cell where they sometimes live on the bodies of insects placed there by the mother at the time she deposited the egg, and sometimes on the nectar of flowers, juices of fruits and animal matters, elaborated in the stomach of the mother, or that of the neuters, who feed them daily.

Wasps properly so called, unite in numerous societies composed of males, females, and neuters. The two last detach particles of old wood or bark with their mandibles, moisten and reduce them into a pultaceous mass resembling that of paper or pasteboard, and construct combs or nests with it that are usually horizontal, and suspended above by one or more pedicles; on the inferior side is a range of vertical cells in the form of hexagonal and truncated pyramids. These cells are appropriated exclusively to the use of the larvæ and nymphs, a cell to each. The number of combs that compose this nest varies. It is sometimes exposed, and at others surrounded by an envelope, pierced with a common and almost always central opening, which sometimes corresponds to a series of holes which communicate with the interior; the combs adhere to the parietes of the envelope, whether they be in the open air or concealed in the earth or hollows of trees. The figure of these structures varies according to the species.

The females commence the business alone, and lay eggs that produce neuters or labourers, which assist in enlarging the nest and taking care of the succeeding young ones. The community is solely composed of these two kinds of individuals until the beginning of autumn, at which period the young males and females make their appearance. All the larvæ and nymphs which cannot complete their ultimate metamorphosis before the month of November are put to death and dragged from their cells by the labourers, which perish along with the males on the approach of winter. Some of the females survive, and in the spring become the founders of a new colony.

Wasps feed on insects, viands of various sorts, or fruit, and nourish their larvæ with the juices of these substances. The latter, which on account of the inferior situation of the mouths of their cells are placed with their head downwards, shut themselves up and spin a cocoon when about to become nymphs.

FAMILY IV.

ANTHOPHILA, *Latreille**.

The fourth and last family of the Aculeata, in the faculty of collecting the pollen of flowers, usually possessed by the two posterior legs, presents a peculiar character which distinguishes it from all other families of insects. The

* Lovers of flowers.

first joint of the tarsi of those legs is very large, strongly compressed, and forms a square palette or a reversed triangle.

The maxillæ and lips are most commonly very long, and compose a sort of proboscis. The ligula is most frequently shaped like the head of a lance, or resembles a very long thread, the extremity of which is downy or hairy. The larvæ feed exclusively on honey and the pollen of flowers. The perfect insect feeds on the honey of the latter only.

These Hymenoptera embrace the genus

Apis, *Linnæus*,

Or that of the Bees, which I will divide into two sections.

In those of the first or the Andrenetæ, Latreille, the intermediate division of the ligula is cordiform or lanceolate, shorter than its sheath, and bent underneath in some, and almost straight in others.



These insects live solitarily, and consist of but two kinds of individuals, males and females*. Most of the females collect the pollen of flowers with the hairs of their posterior legs, and with the aid of a little honey form it into a paste (bee-bread), with which they feed their larvæ. They excavate deep holes, and frequently in hard ground, along the borders of roads, or in the fields, in which they place this paste along with an egg; they then close the aperture with earth.

They form various genera, such as *Hylæus*, *Cottetes*, &c.

The second section of the Anthophila, that of the Apiariæ, Latreille, comprises those species in which the mediate division of the ligula is at least as long as the mentum or its tubular shield, and is filiform or setaceous. The maxillæ and labium are much elongated, and form a sort of proboscis which, when at rest, is geniculate and bent under.

The Apiariæ either live solitarily or form communities.

The former never consist of more than the ordinary number of individuals, and each female provides singly for her young. The posterior legs of their females are neither furnished with a brush on the inner side of the first joint of the tarsi, nor with a particular depression on the exterior side of their tibiæ; this side, as well as the same of the first joint of the tarsi, is most commonly densely covered with hairs.

* It is a physiological circumstance of much interest that all social hymenopterous insects are provided with neuters, for the due support of the community. Neuters are accordingly found amongst the ants, the true wasps, the hive bees, and the humble bees. When, therefore, no neuter individuals exist we may be certain that the insects are not social; now this is precisely the case with the burrowing wasps (*Odynerus*), with many of the Apidæ and with the Andrenidæ. It is true that the latter are often found congregated thickly about some sunny bank, or other convenient place, but their sociality is of no higher order than that which exists amongst the inhabitants of the same street in large towns, where one person scarcely knows his next door neighbour.

One of the most common genera of this section, vulgarly called Humble-Bees, is the

XYLOCOPA, *Latreille, Fabricius.*

The Xylocopæ resemble large Bombi. Their body is usually black, sometimes partially covered with a yellow down; the wings are frequently violet, cupreous or green, and brilliant. The male, in several species, differs considerably from the female. Their eyes are large and approximated superiorly. Their anterior legs are dilated and ciliated.

X. violacea, Lin. About one inch in length; black, with violet-black wings, a russet ring round the antennæ of the male. The female bores a long vertical hole in the body she has selected, usually old dry wood exposed to the sun, and parallel to its surface. It is divided into several cells by horizontal septa formed with agglutinated raspings of wood. She then, commencing with the lowest, deposits an egg and some paste in each of them. She sometimes bores three canals in the same piece of wood.

There are several other genera of solitary Apiariæ.

The last of the Apiariæ form communities composed of *males* and *females*, and a considerable number of *neuters* or *labourers*. In the internal face of the posterior tibiæ of these latter individuals is a smooth depression, in which they place the pellet of pollen collected with the silken down or brush attached to the inner side of the first joint of the tarsi of the same leg. The maxillary palpi are very small and formed of a single joint. The antennæ are geniculate.

Sometimes the posterior tibiæ are terminated by two spines, as in

BOMBUS, *Latreille, Fabricius,*

Where the labrum is transversal, the pseudo-proboscis is much shorter than the body, and the second joint of the labial palpi terminates in a point, bearing the two others on its outer side.

These insects* are well known to children, who frequently put them to death in order to obtain the honey contained within their body. They inhabit subterranean nests in communities of fifty or sixty, and sometimes of two or three hundred individuals. The society is dissolved on the approach of winter. It is composed of *males*, distinguished by their small size, reduced head, narrow mandibles, bearded, and terminated by two teeth, and frequently by a difference of colours; of *females*, which are larger than the others, furnished with mandibles formed like a spoon, as is also the case with those of the *neuters* or *labourers*; the latter, as to size, are intermediate between the males and females.

Such of the ordinary females as have escaped the severity of the winter take advantage of the first fine weather to construct their nests. One species—*Apis lapidaria*—establishes itself on the surface of the earth under stones, but

* They are commonly confounded with the Xylocopæ, and are also called *Humble-Bees.*

all the others form their habitation in it, frequently descending to a depth of one or two feet, in the way we are about to describe. Dry plains, fields, and hills, are the localities they select. These subterranean cavities, which are of considerable extent and wider than high, have the figure of a dome. The ceiling is constructed with earth and with moss, carded by these insects, which they transport there, fibre by fibre, entering the cavity backwards. A coating of coarse wax is laid over its walls. Sometimes a simple opening, designedly left at the bottom of the nest, serves for an entrance, and then again a winding passage covered with moss, and a foot or two long, leads to the domicile. The bottom of the cavity is lined with a layer of leaves, for the accommodation of the brood. The females first place brown, irregular, mamilliform masses of wax there, called *patée* by Réaumur, and which, on account of their shape and colour, he compares to truffles. Their internal cavities are destined to enclose the eggs and larvæ. There the latter live in society until the moment has arrived when they are to become nymphs; they then separate and spin ovoid and silken cocoons, laid vertically against each other. In this state the insect is always reversed, or, like the female nymphs of the common bee, with the head downwards; we always find these cocoons perforated inferiorly, when the perfect insects have left them. Réaumur says that the larvæ feed on the wax which forms their dwelling; according to Huber, it merely protects them from cold and wet, their aliment consisting of a tolerably large quantity of pollen moistened with honey, with which the labourers carefully supply them; when it is consumed they perforate the cover of their cells, furnish them with more, and shut them up again. They even enlarge them when the increased growth of the larvæ causes them to be too much confined. We also find in these nests three or four small bodies composed of brown wax, or the same matter as the patée, and shaped like tumblers or almost cylindrical pots, always open, and more or less filled with good honey. These reservoirs of the honey are not always placed in the same situation.

The larvæ are hatched in four or five days after the eggs have been laid, and complete their metamorphosis in the months of June and July. The labourers remove the wax that clogs their cocoon to facilitate their issue, and assist the female in her work. The number of cells which serve as habitations to the larvæ and nymphs increases, and they form irregular combs placed in stories, on the edges of which we particularly observe the brown patée of Réaumur. According to Huber, the labourers are extremely fond of the ova of the female, and sometimes, in her absence, even break open the cells in which they are deposited, in order to suck the milky fluid they contain! a most extraordinary fact, which seems to belie the known attachment of the labourers for the germs of that race of which they are the protectors and guardians. The wax produced by them, according to this same naturalist, has the same origin as that of our domestic bee, or is merely elaborated honey that also transudes through the intervals of some of the abdominal annuli.

Sometimes the social Apiariæ have no spines at the extremity of their posterior tibiæ, as in

Apis, *Latreille*,

Or that of the bee, properly so called, where the first joint of the posterior tarsi of the labourers forms a long square, and is furnished on the inner side with a silken down divided into transverse or striated bands.

Apis mellifica, Lin. (The Honey-Bee.) Blackish; scutellum and abdomen of the same colour; a transverse greyish band, formed of down, at the base of the third and following abdominal annuli.

The true bees are much smaller and more oblong than the Bombi. Their body is merely furnished with down in particular places, and its colours vary but little. Their communities consist of *labourers* or *neuters*, usually from fifteen to twenty thousand in number, and sometimes extending to thirty thousand; of from six to eight hundred *males*, and in some hives of a thousand and more, called Drones, and commonly of a single *female*, considered by the ancients as the king or head of the community, and styled a queen by us.

The *labourers*, smaller than the others, have their antennæ composed of twelve joints, and the abdomen of six annuli; the first joint of the posterior tarsi, or the *square piece*, is dilated in the form of a pointed palette, at the exterior angle of their base, and densely covered on its inner side with short, fine, silky down; they are armed with a sting. The *female* presents the same characters, but the abdomen of the labourers is shorter. Their mandibles are spoon-shaped, and not dentated. In the outer side of their posterior tibiæ is that smooth depression edged with hairs, called the *corbeille* or basket.

The males and females are the largest; their mandibles are hairy and emarginated under the point; the proboscis is shorter, particularly in the males. These latter differ from the former and from the labourers in their antennæ, which consist of thirteen joints; in their more rounded head and larger eyes, elongated and united above; in their smaller and more hairy mandibles, in the absence of a sting, in the four short anterior legs, of which the two first are arcuated, and finally in the *square piece* which has neither palette nor silken brush.

The interior of the abdominal cavity of the females and labourers presents two stomachs, the intestines, and poison sac. A tolerably large aperture situated at the superior base of the proboscis, under the labrum, and closed by a little triangular piece called *langue* by Réaumur, the *epipharynx* of Savigny, transmits the aliment and leads to a slender œsophagus, which traverses the interior of the thorax, and thence passes to the anterior stomach, or rather crop, which contains the honey. The following stomach, according to Réaumur, contains the pollen or wax-like matter, and has its surface marked by annular and transverse rugæ in the manner of hoops. This abdominal cavity of the females contains two large ovaries composed of numerous sacculi, each of which encloses from sixteen to seventeen eggs. According to the observations of Huber, jun., the inferior semi-annuli of the abdomen of

the labourers, the first and last excepted, have each, on their internal surface, two pouches in which the wax is secreted and moulded into laminæ, that afterwards ooze out through the intervals between the rings.

These observations on the internal anatomy of the bee, with the exception of some few modifications, will apply to the Bombi, properly so called. Wax, according to the experiments of the same naturalists, is nothing more than elaborated honey, and the pollen mixed with a little of that substance only serves as food for these insects and their larvæ.

We have seen that the labourers or working bees resemble the females in several particulars. Certain curious experiments have proved that they are of one sex, and that they are merely females that have not been fully developed in consequence of the nature of the food given to them while in a state of larvæ.

The substance of which their combs are composed, being ill adapted to resist the effects of the weather, and as they do not construct a nest or general envelope, these insects can only establish their colonies in cavities where their work finds a natural shelter. The labourers, which are alone charged with the work, form those laminæ composed of two opposing rows of hexagonal alveoli with a pyramidal base formed of three rhombs. These alveoli have received the name of cells, and each laminæ that of comb. They are always perpendicular, parallel, fixed at top or by one of the edges, and separated by spaces which allow the bees to pass between them. The cells are thus placed horizontally. Distinguished geometricians have demonstrated that their form is the most economical with respect to the expenditure of wax, and the most advantageous as to the extent of the space contained in each cell. Bees, however, know how to modify this form according to circumstances. They cut away and fit their faces piece by piece. These cells, with the exception of that proper to the larva and nymph of the female, are almost equal; some contain the brood, and the remainder the honey and pollen of flowers. Some of the cells containing honey are open, and the remainder, or those held in reserve, are sealed up with a flat or slightly convex lid. The royal cells, which vary in number from two to forty, are much larger, almost cylindrical, somewhat narrower at the end, and have little cavities on their external surface. They usually hang from the margin of the combs, in the manner of stalactites, so that the larvæ contained in them are in a reversed position. Some of them weigh as much as one hundred and fifty of the ordinary cells. The cells of the males are of an intermediate size between those of the preceding and those of the labourers, and placed here and there. Bees always continue their combs from above downwards. They stop the little chinks and apertures of their domicile with a species of mastich, which they collect from different trees, called *propolis*.

Bees take care to furnish their larvæ with paste in quantities proportioned to their age, and on which they cling with their bodies curved into an arc. Six or seven days after they are hatched, they prepare to undergo their metamorphosis. Shut up in their cells by the labourers who close the orifice with

a convex lid, they line the parietes of their domicile with a tissue of silk, spin a cocoon, become nymphs, and, at the expiration of about twelve days, issue forth in their perfect state. The labourers immediately clean out the vacant cells, in order that they may be prepared for the reception of another egg. This is not the case, however, with the royal cells; they are destroyed and new ones constructed if necessary. The eggs containing males are produced two months later, and those producing females soon after the latter.

Dreadful combats sometimes take place among bees. At a particular epoch the labourers put the drones to death, extending the carnage even to the larvæ and nymphs of that sex.

Bees have enemies both external and internal, and are subject to various diseases.

The true bees are only found in the eastern continent; and those of southern and eastern Europe, and of Egypt, differ from those that inhabit France, which have been transported to America and other places, where they are now naturalised.

ORDER X.

LEPIDOPTERA *.

The tenth order of insects terminates the series of those which are furnished with four wings, and presents characters exclusively peculiar to it.

Both sides of the wings are covered with small, coloured scales, resembling farinaceous dust, that are removed by merely coming in contact with the finger. A proboscis, to which the name of *lingua* or tongue has been affixed, rolled spirally between two palpi, covered with scales or hairs, forms the most important part of the mouth, and is the instrument with which these insects extract the nectar from flowers, their only aliment. In our general observations upon the class of insects, we have seen, that this proboscis or trunk is composed of two tubular threads, representing the maxillæ, each bearing, near its external base, a very small superior palpus in the form of a tubercle. The apparent (inferior) palpi, those which form a sort of sheath to the proboscis, replace the labial palpi of the triturating insects; they are cylindrical or conical, usually turned up, composed of three joints, and inserted in a fixed labium, which forms the paries of the portion of the buccal cavity, inferior to the proboscis. Two little and scarcely distinct, corneous, and more or less ciliated pieces, situated, one on each side, on the anterior and superior margin of the front of the head, near the eyes, seem to be vestiges of mandibles. Finally, we observe, and in equally small proportions, the labrum or upper lip.

The antennæ vary and are always multi-articulated. Two ocelli are observable in several species, but concealed between the scales. The three

* Scaly-winged.

segments, of which the trunk of the hexapoda is composed, are united in one single body; the first is very short, and the two others are confounded together. The scutellum is triangular, but the apex is directed towards the head. The wings are simply veined, and vary in size, figure and position; in several, the inferior ones are plaited longitudinally near the inner margin. At the base of each of the superior wings is a kind of epaulette, prolonged posteriorly, that corresponds to the piece called *tegula* in the Hymenoptera. As it is more developed here, I will call it *pterygoda*. The abdomen, composed of from six to seven annuli, is attached to the thorax by a very small portion of its diameter, and presents neither sting nor ovipositor analogous to that of the Hymenoptera. In several females, however, as in *Cossus*, the last rings become narrowed, and extended to form an oviduct resembling a pointed and retractile tail. The tarsi always have five joints. There are never more than two kinds of individuals, males and females.

The females usually deposit their ova, frequently very numerous, on the vegetable surfaces which are to nourish their larvæ, and soon after perish.

The larvæ of Lepidopterous insects are well known by the name of caterpillars. They have six squamous or hooked feet, which correspond to the legs of the perfect insect, and from four to ten additional membranous ones, the two last of which are situated at the posterior extremity of the body; those, which have but ten or twelve in all, have been called, from their mode of progression, *geometræ*. Several of these geometræ, when at rest, remain fixed to the branches of plants by the hind feet alone, where, in the form, colour, and direction of their body, they resemble a twig; they can support themselves in this position for a long time, without exhibiting the slightest symptom of life. So fatiguing an attitude must require prodigious muscular force, and, in fact, Lyonnet counted *four thousand and forty-one muscles* in the caterpillar of the *Cossus ligniperda*.



Cossus.

The body of these larvæ is generally elongated, almost cylindrical, soft, variously coloured, sometimes naked, and sometimes covered with hairs, tubercles, and spines. It is composed of twelve segments or annuli, exclusive of the head, with nine stigmata on each side. Their head is invested with a corneous or squamous dermis, and presents on each side six shining granules, which appear to be ocelli; it is also furnished with two very short and conical antennæ, and a mouth composed of strong mandibles, two maxillæ, a labium, and four small palpi. The silk they employ is elaborated in two long and tortuous internal vessels, of which the attenuated superior extremities terminate in the lip. A tubular and conical mammilla is the spindle through which the threads are spun.

Most caterpillars feed on the leaves of plants; some gnaw their flowers, roots, buds, and seeds; others attack the ligneous or hardest part of trees, softening it by means of a fluid which they disgorge. Certain species attack our woollens and furs, thereby doing us much injury: even our leather,

bacon, wax, and lard, are not spared by them. Several confine themselves exclusively to a single article of diet; others are less delicate, and devour all sorts of matters*.

Some of them form societies, and frequently live under a silken tent, spun by them in common, which even shelters them during the winter. Several construct sheaths for themselves, either fixed or portable. Others make their abode in the parenchyma of leaves, where they form galleries. The greater number are diurnal. The others never issue forth but at night. The severity of winter, so fatal to almost all insects, does not affect certain Phalænæ, which only appear in that season.

Caterpillars usually change their skin four times, previously to passing into the state of a nymph or chrysalis. Most of them spin a cocoon in which they enclose themselves. A frequently reddish liquor, which lepidopterous insects eject at the moment of their metamorphosis, softens or weakens the extremity of the cocoon, and facilitates their exit; one of these extremities also is generally thinner than the other, or presents a favourable issue by the peculiar disposition of the fibres. Other caterpillars are contented with connecting leaves, particles of earth, or of the substances on which they have lived, and thus forming a rude cocoon. The chrysalides of the diurnal Lepidoptera, ornamented with golden spots, whence the term chrysalis, are naked and fixed by the posterior extremity of the body. The nymphs of the Lepidoptera present a special character, of which we have spoken in our general observations on the class of insects. They are swathed or resemble mummies. Those of several insects of this order, particularly of the Diurnæ, undergo their metamorphosis in a few days; they even frequently produce two generations in the course of the year. The caterpillars or chrysalides of others, however, remain during the winter in one of these states, and only appear as perfect insects in the spring or summer of the following year. Generally speaking, the eggs laid in the fall are not hatched till the ensuing spring. The Lepidoptera issue from their envelope in the usual manner, or through a slit, which is effected on the back of the thorax.

The larvæ of the Ichneumonides and Chalcidites deliver us from a great portion of these destructive animals.

We will divide this order into three families, which correspond to the three genera of which it is composed in the system of Linnæus.

FAMILY I.

DIURNA.

This family is the only one in which the exterior margin of the inferior wings does not present a rigid, squamous seta, or kind of bridle, for retaining

* One of the most evident proofs of the divine providence is the perfect coincidence of the appearance of the caterpillar with that of the plant on which it is to feed.

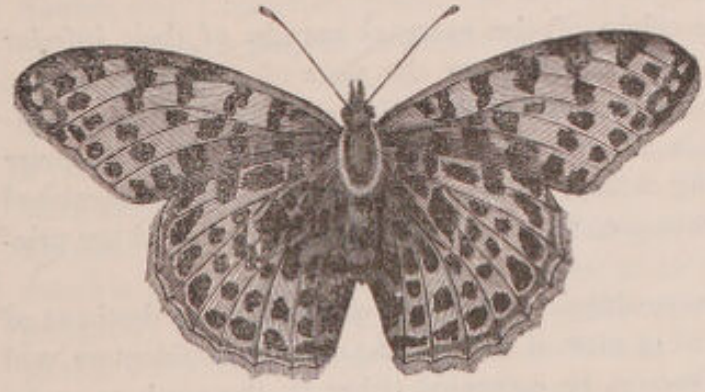
the two superior ones. These latter, and even most frequently the former are raised perpendicularly when the insect is at rest. The antennæ are sometimes terminated by a globuliform inflation or little club, and are sometimes almost of equal thickness throughout or even more slender, and form a hooked point at the extremity. This family comprises the genus

PAPILIO, *Linnæus.*

The larvæ always have sixteen feet. The chrysalides are almost always naked, are attached by the tail, and most commonly angular. The perfect insect, always provided with a proboscis or trunk, flies during the day only, and the colours which ornament the under part of the wings do not yield in beauty to those which decorate their superior surface.

These insects are now divided into two sections. Those of the first have but a single pair of spurs or spines to their tibiæ, which are found on their posterior extremity. Their four wings are raised perpendicularly when at rest. Their antennæ are sometimes inflated at the extremity, globuliform, or in a little club, truncated and rounded at the summit, and sometimes almost filiform. Those in which the inferior palpi are but slightly compressed, distant throughout their length, or at least at their extremity, and abruptly terminated by a slender and acicular joint; where the under surface of the wings frequently presents silvery or yellow spots on a fulvous ground; and the caterpillars of which are always covered with spines or fleshy and hairy tubercles, compose the subgenera CETHOSIA, Fab., and ARGYNNIS, MELITÆA, Fab. In the first, several species of which have elevated and elongated wings, the inferior palpi are distant throughout their whole length, the hooks of the tarsi are simple, and the club of the antennæ is oblong *. In the second it is short and abrupt; the hooks of the tarsi are unidentated, and the inferior palpi are only distant at their extremity. The inferior wings are frequently round.

Some—*Argynnis*, Fab.—have nacred spots on the under part of their wings. Their caterpillars are furnished with spines, two on the neck longer than the rest. Those of the others—*Melitæa*, Fab.—have little hairy tubercles; the wings are spotted like a chess-board, and the nacre is replaced by yellow, a circumstance which sometimes occurs in the preceding one.



Argynnis.

Those in which the inferior palpi are contiguous throughout their whole length, terminated almost insensibly in a point, and strongly compressed, form five other subgenera.

* See the works already quoted.

This section includes a great variety of subgenera, and includes the *Knights*, so called by Linnæus. Those with red spots on the breast are his *Troes* or Trojans, and those in which it is wanting, his *Achivi*, or Greeks. The genus Papilio of Linnæus is now divided into twenty-eight subgenera.

The second section of the Diurnal Lepidoptera is composed of species in which the posterior tibiæ have two pairs of spines, one at their extremity, and the other above; such also is the case in the two following families. The inferior wings are usually horizontal when at rest, and the extremity of their antennæ very often forms a strongly hooked point.

Their caterpillars, of which, however, but few are yet known, bend leaves together, and spin an extremely thin cocoon of silk in the cavity of which they become chrysalides; the latter are smooth or without angular elevations. They compose two subgenera:

Hesperia, *Fabricius*,

Or, the *P. plebei urbicolæ* of Linnæus, in which the termination of the antennæ is distinctly globuliform or clavate, and the inferior palpi are short, broad, and densely covered with scales anteriorly; and the

Urania, *Fabricius*,

Where the antennæ, at first filiform, become attenuated or setaceous at the extremity, and where the inferior palpi are elongated and slender, with the second joint strongly compressed, and the last much smaller, almost cylindrical and naked.

FAMILY II.

CREPUSCULARIA.

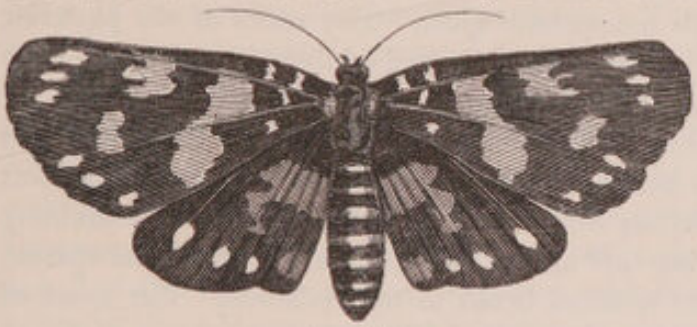
In this family, near the origin of the external margin of their inferior wings, we observe a rigid squamous seta, in the form of a spine or bristle, which passes into a hook on the under surface of the superior wings, maintaining them, when at rest, in a horizontal or inclined position. This character is also visible in the ensuing family, but the Crepuscularia are distinguished from the latter by their antennæ, which form an elongated club, either prismatic or fusiform.

The caterpillars have always sixteen feet. The chrysalides are destitute of the points or angles observed in most of those of the diurnal Lepidoptera, and are usually enclosed in a cocoon, or concealed either in the earth or under some body. These Lepidoptera frequently appear only in the morning or evening. They compose the genus

Sphinx, *Linnæus*,

So named from the attitude of several of the caterpillars, which resembles that of the fabled monster so called.

I will divide this subgenus into four sections. The first, or that of the HESPERI-SPHINGES, consists of Lepidoptera, which evidently connect the Hesperiæ with Sphinx proper. The antennæ are always simple, thickened in the middle or at the extremity, which forms a hook, narrowed into a point at the end, and without a tuft of scales. They all have a very distinct proboscis; the inferior palpi are composed of three very apparent joints. In some, the second is elongated and strongly compressed, the third slender, almost cylindrical, and nearly naked; these palpi resemble those of the Uraniæ; in others, they are shorter but wider, almost cylindrical, and well furnished with scales. The antennæ of the latter are only inflated at the extremity. This section is composed of *Agarista*, *Coronis*, and *Castnia*.



Agarista.

Those of our second section, or the SPHINGIDES, always have the antennæ terminated by a little flake of scales; the inferior palpi broad, or compressed transversely, densely covered with scales, and the third joint usually indistinct.

Most of the caterpillars have an elongated, smooth body, thickest at the posterior extremity, which is furnished with a horn, and its sides striped obliquely or longitudinally. They live on leaves, and are metamorphosed in the earth without spinning a cocoon.

SPHINX proper

Where the antennæ, commencing from the middle, form a prismatic club, simply ciliated, or transversely striated on one side in the manner of a rasp. They have a very distinct proboscis, and fly with great velocity, hovering over flowers with a humming noise. In the chrysalides of some species the sheath of the proboscis projects in the manner of a snout.

S. Atropos, Lin. Superior wings variegated with deep and yellowish-brown, and light-yellowish; inferior wings yellow, with two brown bands; a yellowish spot with two black dots on the thorax; abdomen yellowish, with black annuli, and without a terminal brush. This is the largest species in France. The spot on the thorax resembling a death's head, and the sharp sound it produces (attributed by Réaumur to its rubbing the palpi against its proboscis) have frequently produced considerable alarm among the people in certain years when it was unusually abundant.

The caterpillar is yellow, with blue stripes on the side, and the tail recurved and zig-zag. It feeds on the potato, vine, jasmin, &c., and becomes a chrysalis near the end of August. The perfect insect appears in September.

Our third division, that of the SESIADES, comprises those in which the antennæ are always simple, fusiform, and elongated, and frequently terminated, as in the preceding subgenera, by a little bundle of setæ or scales; in which

the inferior palpi, slender and narrow, have three very distinct joints, the last tapering to a point; and where the extremity of the posterior tibiæ is armed with very stout spines. The abdomen in most of them is terminated by a sort of brush.

The caterpillars feed on the internal part of the stems or roots of plants, like those of the Hepiali and Cossi, are naked, without a posterior horn, and construct their cocoons in these stems with the debris of the substance on which they have fed.

Sesia,

Where the antennæ are terminated by a little tuft of scales. The wings are horizontal and marked with transparent spots. The scales of the posterior extremity of the abdomen form a brush. Several of these insects bear a close resemblance to wasps or other Hymenoptera, to Diptera, &c.

The fourth and last section of the Sphinges, that of the Zygænides, is composed of lepidoptera, in which the antennæ, always terminated in a point destitute of a tuft, are sometimes simple in both sexes, fusiform or resembling a ram's horn, &c. The wings are almost tectiform, and exhibit transparent spots in many. There is no terminal brush to the abdomen. The spurs of the posterior extremity are generally small.

The caterpillars live exposed on various leguminous plants. They are cylindrical, usually pilose, without a posterior horn, similar to those of different species of bombyx, and form a fusiform or ovoid cocoon of silk, which they attach to the stems of plants.

Zygæna.

The Zygænæ are not found in the western continent. Their antennæ are simple in both sexes, and terminate abruptly in a fusiform club, or one resembling a ram's horn; their inferior palpi extend beyond the clypeus, and are pointed at the extremity.

FAMILY III.

NOCTURNA.

In the third family of the Lepidoptera, with some few exceptions, we also find the wings bridled, when at rest, by a bristle or bundle of setæ arising from the exterior margin of the lower ones, and passing into a ring or groove in the under part of the upper ones. The wings are horizontal or inclined, and sometimes rolled round the body. The antennæ gradually diminish in thickness from base to point, or are setaceous.

This family, according to the system of Linnæus, forms but the single genus

Phalæna, *Linnæus*,

Or that of the *Moths*. These lepidoptera seldom fly but at night or after sunset. Several have no proboscis. Some of the females are destitute of

wings, or have but very small ones. The caterpillars most commonly spin a cocoon; the number of their feet varies from ten to sixteen. The chrysalides are always rounded, or without angular elevations or points.

The classification of this family is very embarrassing, and with respect to it our systems are as yet merely imperfect essays or rude sketches. It is now divided into ten sections, each consisting of numerous genera, differing in various details of form and habits, both in the larva or caterpillar state, and that of the perfect insect. They are all nocturnal. These sections are

1. The HEPIALITES. The caterpillars are rare, and remain concealed in the heart of the plants on which they feed; their cocoon is mostly formed of particles of the matter that nourishes them. The margin of the abdominal annuli of the chrysalis is dentated or spinous. The antennæ of the perfect insect are always short, and most frequently present but one sort of small, short, rounded, and crowded teeth. Those of the four others are always terminated by a simple thread; but they are furnished inferiorly in the males with a double line of setæ. The proboscis is always very short, and but slightly apparent. The wings are tectiform and usually elongated. The last abdominal annuli of the females form an elongated oviduct or sort of tail. The caterpillars of these insects are very injurious to several kinds of trees and other useful vegetable productions.

Here we have *Hepialus*, *Cossus*, *Stygia*, *Zeuzera*, &c.

2. The BOMBYCITES are distinguished from those of the preceding one and the third, by the following characters: the proboscis always very short, and merely rudimental; wings either extended and horizontal or tectiform, but the lower ones extending laterally beyond the others; antennæ of the males entirely pectinated.

The caterpillars live in the open air, and feed on the tender parts of plants. Most of them form a cocoon of pure silk. The margin of the abdominal annuli is not dentated in the chrysalis.

BOMBYX proper.

B. mori, Lin. Whitish, with two or three obscure and transverse streaks; a lunated spot on the superior wings.

The caterpillar is well known by the name of *Silk-worm*. It feeds on the leaves of the mulberry, and spins an oval cocoon of a close tissue, with very fine silk, usually of a yellow colour, and sometimes white. A variety is now preferred, which always yields the latter.

The Bombyx which produces it is originally from the northern provinces of China. According to Latreille, the city of Turfan, in Little Bucharia, was for a long time the rendezvous of the western caravans, and the chief entrepot of the Chinese silks. It was the metropolis of the Seres of Upper Asia, or of the Serica of Ptolemy. Driven from their country by the Huns, the Seres established themselves in Great Bucharia and in India. It was from one of their colonies, Ser-hend (*Ser-indi*), that Greek missionaries, in the reign of Justinian, carried the eggs of the silk-worm to Constantinople. At the period of the first crusades, the cultivation of silk was introduced into the kingdom of

Naples from the Morea, and several centuries afterwards, under the administration of Sully particularly, into France. It is well known that silk was formerly sold for its weight in gold, and that it is now a source of great wealth to France.

3. The Pseudo-Bombyces are composed of Lepidoptera, in which, as well as in the following ones, the inferior wings are furnished with a bridle which fixes them to the superior, when at rest. They are then entirely covered by the latter, both being tectiform or horizontal, but with the inner margin overlapped. The proboscis, towards the latter end of the tribe, begins to lengthen, and, in the last subgenera, even scarcely differs from that of other Lepidoptera, except in being somewhat shorter. The antennæ are entirely pectinated or serrated, at least in the males. All their caterpillars live on the exterior parts of plants.

There are eight subgenera, *Sericaria*, *Notodonta*, *Orgyia*, &c.

4. The Aposura are removed, as we have observed in the general divisions of this family, by a unique character, viz. the absence of the anal feet of the animal in its larva state. The posterior extremity of the body terminates in a point, which in several is forked, or even presents two long, articulated, and moveable appendages, forming a sort of tail. With respect to their proboscis, palpi, and antennæ, these insects are but slightly removed from the preceding ones.

5. The Noctuælites, Lat., are similar to the preceding insects in the figure and relative size of the wings, and in their position when at rest, but present the two following distinguishing characters: a horny, and most commonly long, spirally rolled proboscis; inferior palpi abruptly terminated by a very small or much more slender joint than the preceding one; the latter much wider, and strongly compressed.

The body of the Noctuælites is more covered with scales than with a woolly down. Their antennæ are usually simple. The back of the thorax is frequently tufted, and the abdomen forms an elongated cone; they fly with great rapidity. Some of them appear during the day.

Their caterpillars usually have sixteen feet; the others have two or four less, but the two posterior, or anals, are never absent, and in those which present but twelve, the anterior pair of the membranous ones are as large as the next. Most of these caterpillars enclose themselves in a cocoon to complete their metamorphosis.

Here we have *Erebus* and *Noctua*.

6. The Phalænæ Tortrices, Lin., are closely allied to the two preceding sections. The superior wings, of which the exterior margin is arcuated at base and then narrowed, their short and wide figure forming a truncated oval, give a very peculiar appearance to these insects. They have a distinct proboscis, and their inferior palpi are usually almost similar to those of the Noctuæ, but somewhat salient.

They are small and prettily coloured; their wings are tectiform, but flattened almost horizontally, and always laid on the body. In this case the upper ones are slightly crossed along the inner margin.

Their caterpillars have sixteen feet, and their body is closely shorn or but slightly pilose. They twist and roll up leaves of trees, connecting various points of their surface at different times by layers of silken threads running in one direction, and thus form a tube in which they reside, and feed in tranquillity on their parenchyma. Others form a nest by connecting several leaves or flowers with silk. Some of them inhabit fruits.

The posterior extremity of the body is narrow in several. Their cocoon has the figure of a bateau, and is sometimes of pure silk, and at others mixed with foreign matters.

The Tortrices compose the subgenus PYRALIS, Fab.

7. The GEOMETRÆ comprise Lepidoptera in which the body is usually slender, the proboscis either nearly wanting, or generally but slightly elongated, and almost membranous. The inferior palpi are small, and almost cylindrical. The wings are simple, extended, or tectiform and flattened. The antennæ of several males are pectinated. The thorax is always smooth. The caterpillars usually have but ten feet; the others present two more, and those at the extremity always exist. Their peculiar mode of progression has caused them to be styled *Geometræ*, or *Measurers*. When about to advance, they first cling with their anterior or squamous feet, then elevate their body so as to form a ring, in order to approximate the posterior extremity of the body to the anterior, or that which is fixed; they cling with the last feet, disengage the first, and move the body forwards, when they recommence the same operation. Their attitude when at rest is singular. Fixed to a branch of some plant by the last feet only, their body remains extended in a straight line in the air, and absolutely motionless. So closely does the skin resemble the branch in its colour and inequalities, that it is easy to confound them. In this way and at an angle of forty-five degrees, or more, with the limb to which they are attached, these animals remain for hours and even days.

The chrysalides are almost naked, or their cocoon is extremely thin, and poorly furnished with silk.

This section, exclusive of the caterpillars, contains but one subgenus, or PHALÆNA proper.

8. The DELTOIDES, Lat., consist of species very analogous to true Phalænæ, but whose caterpillars have fourteen legs, and roll up leaves. In the perfect insect the inferior palpi are elongated and recurved. Its wings and body, on the sides of which the former are extended horizontally, form a sort of delta, marked by a re-entering angle in the posterior side, or appearing to be forked. The antennæ are usually pectinated or ciliated.

The Deltoides form the subgenus HERMINIA, Latreille.

9. The TINEITES comprise the smallest species of this order. Their caterpillars are always closely shorn, furnished with sixteen feet at least, and rectigrade, living concealed in dwellings fabricated by themselves, either fixed or moveable. Here the wings form a sort of elongated and almost flattened triangle, terminated by a re-entering angle; such are the *Pyralides* of Linnæus; they have four distinct and usually exposed palpi. There, the superior wings are long and narrow, sometimes moulded on the body, and forming a sort of rounded roof to it, sometimes almost perpendicularly decumbent and laid on

the sides, and frequently raised or ascending posteriorly like the tail of a cock. In both cases the inferior wings are always wide and plaited. These species also frequently have the four palpi exposed.

All the caterpillars, whose habitations (sheaths) are fixed or immoveable, are the *Pseudo-Tineæ* of Réaumur; those which construct portable ones, which they transport with them, are true Tineæ.

The substances on which they feed, or on which they reside, furnish the materials of the structure.

Of those sheaths which are composed of vegetable matters, many are very singular. Some, like those of the Adelæ, are covered exteriorly with portions of leaves laid one over the other, and forming a sort of flounce: others are in the form of a bat, and sometimes dentated along one of their sides. The material of some of them is diaphanous, and as if cellular or divided by scales.

The caterpillars of the true Tineæ, commonly called moths, clothe themselves with particles of woollen stuffs, which they cut with their jaws and on which they feed, hairs of furs, and those of the skins of animals in zoological collections, united by silk. They know how to lengthen their sheath, or to increase its diameter by slitting it and adding a new piece. In these tubes they undergo their metamorphosis, after closing the orifices with silk.

The Pseudo-Tineæ content themselves with mining the interior of the vegetable and animal substances on which they feed, and forming simple galleries, or if they construct sheaths either with those matters or silk, they are always fixed, and are mere places of retreat.

These caterpillars, which perforate in various directions the parenchyma of the leaves on which they feed, have been called Miners. They produce those desiccated spaces, in the form of spots and undulating lines, frequently observed on leaves. Buds, fruits, and seeds of plants, frequently those of wheat, and even the resinous galls of certain Coniferæ, serve for aliment and habitations to others. These insects are frequently ornamented with the most brilliant colours. In several species the superior wings are decorated with golden or silver spots, sometimes even in relief.

AGLOSSA, *Latreille*,

Where the four palpi are exposed, and the wings form a flattened triangle; there is no emargination in the extremity of the upper one.

A. pinguinalis. Superior wings agate-grey, with blackish stripes and spots. Found in houses on the walls.

Its caterpillar is naked, blackish-brown, glossy, and feeds on fatty or butyraceous substances. Réaumur called it the *Fausse-teigne-des cuirs*, because it also feeds on leather and the covers of books. It constructs a tube which it places against the body on which it feeds, and covers it with granules.

GALLERIA, *Fabricius*,

Where the scales of the clypeus form a projection that covers the palpi; and the superior wings, proportionally narrower than in Aglossa, and emarginated in the posterior edge, are, as well as the inferior ones, strongly inclined and turned up posteriorly like the tail of a cock, as in many species of the following subgenera:

G. cereana, Fab. About five lines in length; cinereous; head and thorax paler, and little brown spots along the internal margin of the superior wings.

Réaumur designates its caterpillar by the name of *fausse-teigne de la cire*, It ravages hives by penetrating into the combs, constructing, as it progresses, a silken tube covered with granules, which are formed of the wax on which it feeds. The cocoons of their chrysalides are sometimes found collected in piles.

TINEA,

Where the proboscis is very short and formed of two little membranous and separated threads. The head is crested.

P. tapezana, Fab. Upper wings black; their posterior extremity, as well as the head, white.

The caterpillar attacks cloth and other woollen stuffs, on which it lies concealed in a semi-tubular sheath formed of their particles, which it lengthens as it advances.

T. pellionella, Fab. Upper wings silver grey, with one or two black dots on each. The caterpillar inhabits a felted tube on furs; it cuts the hairs at base and rapidly destroys them. The

T. flavifrontella, Fab., ravages cabinets of natural history in the same way.

T. granella, Fab. Its upper wings are marbled with grey, brown and black, and turned up posteriorly. The caterpillar—*fausse-teigne des blés*—connects several grains of wheat with silk, and forms a tube from which it occasionally issues to feed upon those seeds. It is very noxious.

10. The FISSIPENNÆ are closely related to the preceding insects so far as relates to the narrow and elongated form of the body and upper wings, but are removed from them, as well as from all others of this order, by the four wings, or at least two, being split longitudinally in the manner of branches or fingers with fringed edges, and resembling feathers. The wings resemble those of birds. They constitute the subgenus

PTEROPHORUS.

The caterpillars have sixteen feet, and live on leaves or flowers without constructing a tube.

ORDER XI.

RHIPIPTERA.

THIS order was established by Mr. Kirby under the name of *Stresiptera* (twisted wings), on certain insects remarkable for their anomalous form and irregular habits.



From the two sides of the anterior extremity of the trunk, near the neck and the exterior base of the two first legs, are inserted two small, crustaceous, moveable bodies, in the form of little elytra, directed backwards, that are narrow, elongated, clavate, curved at the extremity, and terminate at the origin of the wings. As elytra, properly so called, always covers the whole or the base of the latter organs and arise from the second segment of the

trunk, these bodies are not true wing-cases, but parts analogous to those (*pterygoda*) we have already observed at the base of the wings in the Lepidoptera. The wings of the Rhipiptera are large, membranous, divided by longitudinal and radiating nervures, and fold longitudinally in the manner of a fan. The mouth consists of four pieces, two of which, the shortest, appear to be so many biarticulated palpi; the others, inserted near the internal base of the preceding ones, resemble little linear laminæ, which are pointed and crossed at their extremity like the mandibles of various insects; they bear a greater similitude to the lancets of the sucker of the Diptera than to true mandibles. The head is also furnished with two large hemispherical, slightly pediculated, and granular eyes; two almost filiform and short antennæ, approximated at base on a common elevation, consisting of three joints, the two first of which are very short, and the third very long, and divided down to its origin into two long, compressed, lanceolate branches, laid one against the other. The ocelli are wanting. The form and divisions of the trunk are very similar to those of several Cicadariæ, Psyllæ, and Chrysides. The abdomen is almost cylindrical, consists of eight or nine segments, and is terminated by pieces also analogous to those observed at the extremity of the above-mentioned Hemiptera.

These insects, in their larvæ state, live between the abdominal scales of several species of Andrenæ and Wasps of the subgenus Polistes. They frisk about with a simultaneous motion of the wings and halteres. Although they appear to be removed in several respects from the Hymenoptera, I still think it is to some of those insects, such as the Eulophi, that they are most nearly allied.

Mr. Peck has observed one of the larvæ—*Xenos Peckii*—which is found on wasps. It forms an oblong oval, is destitute of feet, and is annulated or plaited; the anterior extremity is dilated in the form of a head, and the mouth consists of three tubercles. These larvæ become nymphs in the same place, and, as it appeared to me, when examining the nymphs of the *Xenos Rossi*, another insect of the same order, within their own skin, and without changing their form.

Nature has perhaps furnished the Rhipiptera with the two false elytra of which we have spoken, to enable them to disengage themselves from between the abdominal scales of the insects on which they have lived. They are a sort of *Œstri* to insects, and we shall soon find a species of Conops that undergoes its metamorphosis in the abdomen of the Bombi. The Rhipiptera form two genera.

Stylops, *Kirby.*

The first one observed and instituted by Mr. Kirby. The superior branch of the last segment of the antennæ is composed of three little joints. The abdomen is retractile and fleshy.

But a single species is known; it lives on the Andrenæ.

XENOS, *Ross.*

Here the two branches of the antennæ are inarticulated. The abdomen, with the exception of the anus, which is fleshy and retractile, is corneous.

Two species of this genus are known, one of which lives on the wasp called *gallica*, and the other on an analogous wasp of North America, the *Polistes fucata*, Fab.

ORDER XII.

DIPTERA*.

THE distinguishing characters of dipterous insects consist in six feet; two membranous, extended wings, with, almost always, two moveable bodies above them called *halteres;* a sucker composed of squamous, sectaceous pieces, varying in number from two to six, and either enclosed in the superior groove of a probosciform sheath terminated by two lips, or covered by one or two inarticulated laminæ which form a sheath for it.



Their body, like that of other hexapoda, is composed of three principal parts. The number of ocelli, when any are present, is always three. The antennæ are usually inserted on the front and approximated at base; those of the Diptera of our first family resemble those of the nocturnal Lepidoptera in form and composition, and frequently in their appendages; but in the following and greater number of families they consist of but two or three joints, the last of which is fusiform or shaped like a lenticular or prismatic palette, furnished either with a little styliform appendage, or a thick hair or seta, sometimes simple and sometimes hairy. Their mouth is only adapted for extracting and transmitting fluids. When these nutritive substances are contained in particular vessels with permeable parietes, the appendages of the sucker act as lancets, pierce the envelope, and open a passage to the fluid, which, by their pressure, is forced to ascend the internal canal to the pharynx, situated at the base of the sucker. The sheath of the latter, or the external part of the proboscis, merely serves to maintain the lancets in situ, and when they are to be employed it is bent back. The base of the proboscis frequently bears two filiform or clavate palpi, composed, in some, of five joints, but in the greater number of one or two. The wings are simply veined, and most frequently horizontal.

The use of the halteres is not yet well known; the insect moves them very rapidly. In many species, those of the last families particularly, and above the halteres, are two membranous appendages resembling the valves of a shell, and connected by one of their sides, called (*ailerons* or *cuillerons*) alulæ.

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* Two-winged.

One of these pieces is united to the wing and participates in all its motions, but then the two parts are nearly in the same plane. The size of these alulæ is in an inverse ratio to that of the halteres. The prothorax is always very short, and frequently we can merely discover its lateral portions.

The abdomen is frequently attached to the thorax by a portion only of its transversal diameter. It is composed of from five to nine apparent annuli, and usually terminates in a point in the females; in those where the number of annuli is less, the last ones frequently form a sort of ovipositor presenting a succession of little tubes sliding into each other like the joints of a spy-glass. Their usually long and slender legs are terminated by a tarsus of five joints, the last of which has two hooks, and very often two or three vesicular or membranous pellets.

Many of these insects are noxious both by sucking our blood and that of our domestic animals, by depositing their eggs on their body in order that their larvæ may feed on them, and by infecting our preserved meats and cerealia. Others in return are highly useful to us by devouring noxious insects, and consuming dead bodies and animal substances left on the surface of the earth, that poison the air we breathe, and by accelerating the dissipation of stagnant and putrid water.

The term of life assigned to the perfect Aptera is very short. They all undergo a perfect metamorphosis, modified in two principal ways. The larvæ of several change their skin to become nymphs. Some even spin a cocoon, but others never change their tegument, which becomes sufficiently solid to form a case for the nymph, resembling a seed or an egg. The body of the larva is first detached from it, leaving on its internal parietes the external organs peculiar to it, such as the hooks of the mouth, &c. It soon assumes the form of a soft or gelatinous mass, on which none of the parts that characterise the perfect insect can be seen. After the lapse of a few days, those organs become defined and the insect is a true nymph. It extricates itself from confinement by separating the anterior extremity of its case which comes off like a cap.

The larvæ of the Diptera are destitute of feet, though appendages that resemble them are observable in some. This order of insects is the only one in which we find larvæ with a soft and variable head. This character is almost exclusively peculiar to the larvæ of those which are metamorphosed under their skin. Their mouth is usually furnished with two hooks that enable them to stir up alimentary substances. The principal orifices of respiration, in most of the larvæ of the same order, are situated at the posterior extremity of their body. Several of them, besides, present two stigmata on the first ring, that which immediately follows the head or replaces it.

We will divide the Diptera into two principal sections. In those which compose the first, the head is always distinct from the thorax, the sucker is enclosed in a sheath, and the hooks of the tarsi are simple or dentated. The metamorphosis of the larvæ into nymphs is always effected after they have left the mother. In the first subdivision we find Diptera whose antennæ are multi-articulated.

FAMILY I.

NEMOCERA.

In this family the antennæ usually consist of from fourteen to sixteen joints, and from six, or nine, to twelve, in the others. They are either filiform or setaceous, frequently hairy, particularly in the males, and much longer than the head. The body is elongated, the head small and rounded, the eyes large, the proboscis salient, and either short and terminated by two large lips, or prolonged into a siphon-like rostrum, with two exterior palpi inserted at its base, usually filiform or setaceous, and composed of four or five joints. The thorax is thick and elevated; the wings are oblong; the halteres are entirely exposed and apparently unaccompanied with alulæ. The abdomen is elongated, and most commonly formed of nine annuli; it terminates in a point in the female, but is thicker at the end and furnished with hooks in the males. The legs are very long and slender, and are frequently used by these insects to balance themselves. Several, particularly the smaller ones, collect in the air in numerous swarms, and, as they flit about, form a sort of dance. They are found at almost every season of the year. Some of the females commit their ova to the water; others deposit them in the earth or on plants.

The larvæ, always elongated and resembling worms, have a squamous head, always of the same shape, the mouth of which is furnished with parts analogous to maxillæ and lips. They always change their skin to become nymphs. The latter, sometimes naked, and sometimes enclosed in cocoons constructed by the larvæ, approximate in their figure to the perfect insect, present their external organs, and complete their metamorphosis in the usual manner. They have frequently, near the head or on the thorax, two organs of respiration resembling tubes. This family is composed of the genera *Culex* and *Tipula* of Linnæus.

Some, in which the antennæ are always filiform, as long as the thorax, densely pilose, and composed of fourteen joints, have a long, projecting filiform proboscis, containing a piercing sucker consisting of five setæ. They constitute the genus

Culex, *Linnæus,*

Or the Mosquetoes, where the body and legs are elongated and hairy; the antennæ densely pilose, the hairs forming tufts in the males; the eyes large and closely approximated or convergent at their posterior extremity; the palpi projecting, filiform, hairy, as long as the proboscis, and composed of five joints in the males, shorter, and apparently with fewer articulations in the females. The proboscis is composed of a membranous, cylindrical tube, terminated by two lips forming a little button or inflation, and of a sucker consisting of five

squamous threads which produces the effect of a sting. The wings are laid horizontally, one over the other, on the body, with little scales.

The torment we experience from these insects, particularly in the vicinity of low grounds and water, where they are most abundant, is well known. These insects also feed on the nectar of flowers.

The female deposits her eggs on the surface of the water, and places them side by side in a perpendicular direction; the entire mass resembles a little bateau floating on that element. Each female lays about three hundred eggs in the course of the year. These insects frequently survive the most intense cold. Their larvæ swarm in the green and stagnant waters of ponds and ditches, particularly in spring, the period at which those females lay their eggs who have passed through the winter. They suspend themselves on the surface of the water in order to respire, with their head downwards. These larvæ are very lively, swim with considerable velocity, and dive from time to time, but soon return to the surface. After some changes of tegument, they then become nymphs, which still continue to move by means of their tail and its two terminal fins. These nymphs also remain on the surface of the water, but in a different position from that of the larvæ, their respiratory organs being placed on the thorax; they consist of two tubular horns. It is in the water also that the perfect insect is developed. Its exuviæ form a sort of float or resting place, which keeps it from submersion. All these metamorphoses occur in the space of three or four weeks, and several generations are produced in the course of the year.

In the other Nemocera, the proboscis is either very short and terminated by two large lips, or in the form of a siphon or rostrum, but directed perpendicularly or curved on the pectus. The palpi are bent underneath, or turned up, but, in that case, from one to two joints only.

Linnæus comprises them in his genus

TIPULA,

Which is now variously divided and subdivided. It includes the various species of the *Crane-fly*.

All the following Diptera, a small number excepted, have their antennæ composed of three joints, the first of which is so short, that it may be excluded from the calculation; the last is annulated transversely, but without distinct divisions. It is frequently accompanied with a seta, usually lateral, and situated on the summit in others, presenting two joints at base, sometimes simple and sometimes silky. The palpi never have more then two joints.

Some, a few excepted, whose larvæ divest themselves of their skin previous to becoming pupæ, always have a sucker composed of four or six pieces; the proboscis, or at least its extremity, that is to say, its lips, is always salient. The palpi, when they exist, are exterior, and inserted near the margin of the oral cavity, close to which arises the sucker.

The larvæ, even of those in which the skin forms a cocoon for the pupa (*Stratiomys*), retain their primitive form.

This subdivision will comprise three families.

FAMILY II.

TANYSTOMA *.

The Diptera of this family are distinguished from those of the two following ones by the last joint of the antennæ, which, exclusive of the seta which may terminate it, presents no transverse division; the sucker is composed of four pieces.

Their larvæ resemble long and almost cylindrical worms, with a constant and squamous head, always provided with hooks or retractile appendages, by which they are enabled to gnaw or suck the alimentary matters on which they feed. They change their skin to undergo their second metamorphosis. The nymphs are naked, and exhibit several of the external parts of the perfect insect, which issues from its exuviæ through a slit in the back.

In our first division we find species whose proboscis is always entirely (or nearly) salient, with the exterior envelope or the sheath of the sucker solid or almost corneous, projecting more or less in the form of a tube or siphon, sometimes cylindrical or conical, and sometimes filiform, terminating without any remarkable enlargement, the lips being small or confounded with the sheath. The palpi are small.

Some, that are rapacious, have an oblong body, the thorax narrowed before, and the wings incumbent; their proboscis is most commonly short or but slightly elongated, and forms a sort of rostrum. The antennæ are always approximated, and the palpi apparent.

Asilus, *Linnæus*,

Where the proboscis is directed forwards. They fly with a humming noise, are carnivorous, voracious, and, according to their size and power, seize on flies, tipulæ, bombi or Coleoptera, which they can exhaust by suction. Their larvæ have a small squamous head, armed with two moveable hooks, live in the earth, and there become nymphs, whose thorax is furnished with dentated hooks, and the abdomen with small spines.

Empis, *Linnæus*,

Closely allied to Asilus in the form of the body, and the position of the wings, but with the proboscis perpendicular or directed backwards. The head is rounded and almost globular; the eyes very large.

These insects are small and live on prey and the nectar of flowers. The last joint of their antennæ is always terminated by a biarticulated or short stilet, or by a seta.

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* Long-mouthed.

The remaining Tanystoma of our first division usually have a short, wide body, the head applied directly to the thorax, the wings distant, and the abdomen triangular. In a word, their general appearance is that of our domestic fly. Their proboscis is frequently long.

Cyrtus, *Latreille*,

Intermediate between Empis and Bombylius. The wings are inclined on each side of the body; and the alulæ very large and covering the halteres; the head is small and globular, the thorax very high or gibbous, the abdomen vesicular and rounded, or almost cubical; the antennæ are closely approximated, and the proboscis is directed backwards or wanting.

Bombylius, *Linnæus*—Bombyliers, *Latreille*,

Where the wings are extended horizontally on each side of the body, and the halteres are exposed. The thorax is higher than the head, or gibbous as in Cyrtus; the antennæ are closely approximated, and the abdomen is triangular or conical; the proboscis is directed forwards. The proboscis is generally very long and most slender at the extremity. Their legs are long and attenuated. They fly with great velocity, hover over flowers without alighting on them, introduce their trunk into the calyx to obtain their nectar, and produce a sharp humming sound.

Anthrax, *Scopoli, Fabricius.*

Similar to Bombylius; but where the body is depressed, or but slightly elevated and not gibbous, with the head as high and as broad as itself. The antennæ are always short, and distinct from each other, and always terminated by a subulate or punch-like joint. The proboscis, except in a small number, is generally short, extending but little beyond the head, frequently even withdrawn into its oral cavity, and terminated by a little inflation formed by the lips. The palpi are usually concealed, small, filiform, and each, at least in several, adhering to one of the threads of the sucker. The abdomen is less triangular than that of the Bombylii, and partly square. These insects are generally hairy. Their habits are very analogous to those last mentioned. They frequently alight on the ground, on walls exposed to the sun, and on leaves.

Our second general division of the Tanystoma is characterised by a membranous proboscis, usually with a short stem, projecting but slightly, and terminated by two very distinct and raised or ascending lips.

The form of the head in the larvæ of the last Diptera of this division is variable.

In some—*Leptides*—the wings are distant and exhibit several complete cells. The antennæ are not terminated *en palette*. The palpi are filiform or conical.

Sometimes these palpi are withdrawn into the oral cavity. The antennæ have a fusiform termination or one resembling an elongated cone, with a little articulated stilet at the end.

THEREVA, *Latreille,*

T. plebeia. Black, with cinereous hairs; abdominal annuli margined with white. On plants.

Sometimes the palpi are exterior. The last joint of the antennæ is either almost globular or reniform, or nearly ovoid or conical, and terminated by a long seta.

The tarsi are furnished with three pellets. They form the genus

LEPTIS,

Which is divided into several subgenera. We may notice the

L. vermileo. Resembling a tipula; yellow; four black streaks on the thorax; the abdomen elongated, with five ranges of black spots; wings immaculate.

The larva is almost cylindrical; its anterior portion is much the smallest, and there are four mandibles on the opposite extremity. It resembles a stick-like geometra (caterpillar), and is equally rigid when withdrawn from its domicile. It bends its body in every direction, advances and moves about in the sand, and excavates there an infundibuliform cavity, at the bottom of which it secrets itself either entirely or partially. If an insect be precipitated into the trap, it rises suddenly, clasps it with its body, pierces it with the stings or hooks of its head, and sucks it. It flings away the carcass as well as the sand, by bending its body, and then suddenly relaxing it, like a bow.

The pupa is covered with a layer of sand.

The other Tanystoma of our second division have their wings incumbent on the body. The antennæ terminate in a palette, almost always accompanied by a seta. The palpi of the greater number are flattened or laminiform, and laid on the proboscis.

These characters, a body compressed on the sides, a triangular head, slightly projecting in the manner of a snout, the abdomen curved underneath, and long, slender legs furnished with little spines, particularly distinguish the genus

DOLICHOPUS, *Latreille, Fabricius,*

Which now forms a small tribe. These insects are frequently green or cupreous. The legs are long and very slender. They are found on walls, trunks of trees, &c. Some of them run along the surface of the water with great celerity.

FAMILY III.

TABANIDES.

OUR third family of the Diptera is characterised by a salient proboscis, usually terminated by two lips with projecting palpi, by the last joint of the antennæ being annulated, and by a sucker composed of six pieces: it comprises the genus

Tabanus, *Linnæus,*

Or the *Horse-flies*. These Diptera are very similar to large flies, and well known by the torment they occasion to cattle, by piercing their skin in order to suck their blood. Their body is usually but slightly pilose. Their head is as wide as the thorax, almost hemispherical, and with the exception of a small space, particularly in the males, occupied by two eyes, generally of a golden-green, with purple spots or streaks. Their antennæ are about the length of the head, and are composed of three joints, the last of which is the longest, terminates in a point, has neither seta nor stilet at the end, is frequently lunate above its base, and with from three to seven transverse and superficial divisions. The proboscis of the greater number is almost membranous, perpendicular, of the length of the head or somewhat shorter, almost cylindrical, and terminated by two elongated lips. The two palpi, usually incumbent on it, are thick, pilose, conical, compressed and biarticulated. The sucker inclosed in the proboscis is composed of six small pieces, in the form of lancets, which, by their number and relative situation, correspond to the parts of the mouth in the Coleoptera. The wings are extended horizontally on each side of the body. The alulæ almost completely cover the halteres. The abdomen is triangular and depressed. The tarsi are furnished with three pellets.

These insects begin to appear towards the close of spring, are very common in the woods and pastures, and produce a humming noise when on the wing. They even pursue Man in order to suck his blood. Beasts of burden, having no means of repulsing them, are most exposed to their attacks, and are sometimes seen covered with blood from the wounds they inflict. The insect mentioned by Bruce, under the name of *Tsaltsalya*, which is dreaded even by the lion, may possibly belong to this genus.

T. bovinus, Lin. An inch long; body brown above, grey beneath; eyes green; tibiæ yellow; transverse lines and triangular spots of pale yellow on the abdomen; wings transparent, with russet-brown nervures.

The larva lives in the ground. It is elongated, cylindrical, and attenuated towards the head, which is armed with two hooks. The nymph is naked, and ascends to the surface of the soil when about to divest itself of its skin, in order to assume the form of a tabanus, and protrudes the half of its body above it.

FAMILY IV.

NOTACANTHA*.

The fourth family of the Diptera, as well as the preceding one, presents antennæ of which the third and last joint is divided transversely in the manner of a ring, or which are even composed of five very distinct joints; but the sucker is formed of only four pieces, and the proboscis, the stem of which

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* Spiny-backed.

is usually very short, is almost entirely retracted within the oral cavity. The membranous nature of that organ and its turned up lips, its similarly raised and clavate palpi, the relative disposition of the wings which are usually crossed, the form of the abdomen which is rather oval or orbicular than triangular, and finally the scutellum, which is frequently armed with teeth or spines, also distinguish the Notacantha from the Tabanides.

But few of their larvæ have been observed. Such as have been discovered are described and figured by Swammerdam, Réaumur and Rœsel, are aquatic, and approximate to those of the Athericera in their soft head, varying in form, and in their habit of becoming pupæ under their own skin; but they retain their primitive form and proportions, thus differing from those of the latter.

Other larvæ of the Notacantha—*Xylophagus*—live in the carious and diseased parts of trees.

We divide the Notacantha into three principal sections.

Those of the first—*Mydasii*, Lat.,—never have teeth or spines in the scutellum. Their body is oblong, and the abdomen forms an elongated and conical triangle. The wings are distant. Their antennæ, from which we draw their most distinguishing character, are sometimes composed of five distinct joints, the two last of which form a club in some, and the extremity of a cylindrical stem with a subulate termination in others, and sometimes of three joints, the last of which is largest, almost cylindrical, tapers to a point and is divided into three annuli; thus these organs are always divided into five.

In some the antennæ are much longer than the head, consist of five joints, are terminated in an elongated club formed by the two last, with an umbilicus at the end from which issues a very short seta. The posterior thighs are stout, and dentated or spinous on the inner side. The tarsi have but two pellets. The posterior cells of the wings are complete or closed before the margin, or narrow or elongated, oblique or transverse.

These insects compose the genus

MYDAS,

Which is divided into two subgenera. CEPHALOCERA, Lat., where the proboscis is in the form of a long and projecting siphon, and MYDAS, Fab., or Mydas proper, where that organ, as is usual in this family, terminates by two large lips.

In the others, the antennæ are scarcely longer than the head, cylindrical and tapering to a point at their extremity. The tarsi are furnished with three pellets. The posterior cells of the wings are longitudinal and closed by their posterior margin.

CHIROMYZA, *Wiedemann*,

Where the antennæ are composed of five well separated joints, the two last of which are the smallest.

Pachystomus, *Latreille,*

Where the antennæ are composed of three joints, the last of which is divided into as many rings.

In the second section, that of the *Decatoma,* Lat., we find the antennæ always composed of three joints, the last of which, the longest, without stilet or seta, and divided into eight rings, is clavate in some, and almost cylindrical or in the form of an elongated cone in the others. The wings are usually incumbent on the body. The tarsi are furnished with three pellets.

These insects may be united in one generic section.

Xylophagus.

In Xylophagus proper, the body is narrow and elongated, and the antennæ are evidently somewhat longer than the head, and terminated by an almost cylindrical joint. The head is short, transversal, and without any particular elevation anteriorly.

In the third section—*Stratiomydes,* Lat.,—we also find antennæ consisting of three joints, the last of which, exclusive of the stilet or seta, presents at most five or six rings. This stilet, or that seta, exists in almost all of them, and in those where they are wanting, the third joint is elongated and fusiform, and always divided into five or six rings. The wings are always incumbent one on the other. In several of those species where the antennæ terminate in a somewhat oval and globular club, and always furnished with a stilet or a seta, the scutellum is not spinous.

This section comprises the genus

Stratiomys, *Geoffroy.*

In Stratiomys, properly so called, the antennæ are much longer than the head, the first and last joint being greatly elongated; the latter is fusiform, or resembles a narrow and elongated club, narrowed at both ends, consisting of at least five distinct rings, without an abrupt stilet at the extremity. The two rings that compose it are not distinguished from the others by any sudden contraction.

The body of the larvæ is long, flattened, invested by a coriaceous or firm skin, and divided into annuli, of which the three last form a tail terminated by numerous plumose hairs which radiate from the extremity. They inhabit water.

Our second general division of the Diptera, which are provided with a sucker enclosed in a sheath, and whose antennæ consist of but two or three joints, comprises those whose proboscis, usually bilabiate, long, geniculate, and bearing the palpi a little above the elbow, is most commonly entirely contained in the oral cavity, and, when always salient, has a sucker composed of only two pieces. The last joint of the antennæ, always accompanied by a stilet or seta, never exhibits annular divisions. The palpi, when at rest, are concealed.

FAMILY V.

ATHERICERA.

Here the proboscis is usually terminated by two large lips. The sucker is never composed of more than four pieces, and frequently presents but two.

The larvæ have a very soft, extremely contractile, annulated body, narrowest and most pointed anteriorly. The head varies as to figure, and its external organs consist of one or two hooks, accompanied in some genera by mammillæ, and probably in all by a sort of tongue destined to receive the nutritious juices on which they feed. They usually have four stigmata, two situated on the first ring, one on each side, and the two others on as many circular, squamous plates at the posterior extremity of the body. It has been observed that these latter, at least in several, were formed of three smaller and closely approximated stigmata. The larva has the faculty of enveloping these parts with the marginal skin, which forms a sort of purse. They never change their skin. That which invests them when first hatched becomes indurated, and thus forms a sort of cocoon for the pupa. It becomes shortened, assumes an ovoidal or globular figure, and the anterior portion, which in the larva was the narrowest, increases in diameter, or is sometimes even thicker than the opposite extremity. Traces of the annuli, and frequently vestiges of the stigmata, are observed on it, although the latter no longer serve for respiration. The body is gradually detached from the skin or cocoon, assumes the figure of an elongated and extremely soft ball, on which none of its parts are perceptible, and soon passes into the state of a pupa. The insect issues from its shell, by removing with its head the anterior extremity, which flies off like a cap, that part of the cocoon being so disposed as to facilitate this result.

But few of the Athericera are carnivorous in their perfect state.

They are generally found on trees, leaves and flowers.

Their proboscis is always long, membranous, geniculate near the base, terminated by two large lips, and encloses the sucker in a superior groove. The upper piece of this sucker, which is inserted near the elbow, is broad, arched, and emarginated at its extremity; the three others are linear and pointed, or setaceous; to each of the two lateral ones, representing the maxillæ, is annexed a little membranous, narrow palpus, slightly widened and rounded at the end; the inferior seta is analogous to the ligula. The head is hemispherical, and mostly occupied by the eyes, that of the males particularly. Its anterior extremity is frequently prolonged in the manner of a snout or rostrum, receiving the proboscis underneath when it is doubled. Several species resemble Bombi and other wasps.

This tribe will comprise but the single genus

Syrphus.

In Syrphus, properly so called, the abdomen is gradually narrowed from base to point.

The larvæ feed exclusively on aphides of all kinds, frequently holding them in the air, and soon exhausting them by suction. Their body forms a sort of elongated cone, and is very uneven, or even spinous. When about to become pupæ, they fix themselves to leaves, &c., with a kind of glue. The body is shortened, and its anterior portion, which was previously the most slender, then becomes the thickest.

The sucker of all the remaining Athericera consist of but two setæ, the superior representing the labrum, and the inferior the ligula.

They form three other small tribes which will correspond to the genera *Œstrus* and *Conops* of Linnæus, and to the *Musca,* Fab., as originally composed.

We will begin with the tribe of the Œstrides consisting of the genus

Œstrus, *Linnæus,*

Which is very distinct, as in place of the mouth we find but three tubercles, or slight rudiments of the proboscis and palpi.

These insects resemble large and densely pilose flies, and their hairs are frequently coloured in bands like those of the Bombi. Their antennæ are very short; each is inserted in a fossula over the front, and terminated by a rounded palette with a simple seta on the back near its origin. Their wings are usually remote; the alulæ are large and conceal the halteres. The tarsi are terminated by two hooks and two pellets.

These insects are rarely found in their perfect state, the time of their appearance and the localities they inhabit being very limited. As they deposit their eggs on the body of various herbivorous quadrupeds, it is in woods and pastures that we must look for them. Each species of Œstrus is usually a parasite of one particular species of mammiferous animal, and selects for the location of its eggs the only part of its body that is suitable for its larvæ, whether they are to remain there, or pass from thence to the spot suited for their development. The ox, horse, ass, rein-deer, stag, antelope, camel, sheep and hare, are the only quadrupeds yet known, which are subject to be inhabited by the larvæ of the Œstri. They seem to have an extraordinary dread of the insect when it is buzzing about them for the purpose of depositing its eggs.

The domicile of the larvæ is of three kinds; we may distinguish them by the names of cutaneous, cervical, and gastric, as some live in the lumps or tumours formed on the skin, others in some part of the interior of the head, and the rest in the stomach of the animal destined to support them.

Œ. bovis, De Geer. From six to seven lines in length, and densely pilose; thorax yellow, with a black band; abdomen white at base, with a fulvous extremity; wings somewhat obscure.

The female deposits her eggs under the hide of healthy oxen and cows, of not more than two or three years of age. The consequence of this operation are tumours or lumps, on the internal pus of which the larvæ feed. Horses also are subject to them.

The rein-deer, antelope, hare, &c., also nourish various larvæ of Œstri, but of a different species.

Œ. ovis, Lin. Five lines in length, and but slightly pilose; head greyish; thorax cinereous, with elevated black points; abdomen yellowish, finely spotted with brown or black; legs pale-brown; wings transparent. The larva inhabits the frontal sinus of the sheep. That of the species called *trompe*, Fab., is found in the same parts in the rein-deer.

Œ. equi, Lat., Clarck. But slightly pilose, and of a fulvous brown; abdomen paler; two points and a band on the wings, black. The female deposits her ova on the legs and shoulders of horses; the larvæ inhabit their stomach.

The third tribe of the Athericera, that of the Conopsariæ, is the only one of that family in which the proboscis is either always salient and siphoniform, cylindrical or conical, or setaceous. The reticulation of the wings is the same as in our first division of the Muscides.

Most of these insects are found on plants. They form the genus

Conops, *Linnæus.*

In Conops properly so called, the two last joints of the antennæ form a club, with a terminal stilet.

C. rufipes, Fab. Black; abdominal annuli edged with white; base of the abdomen and legs fulvous; edges of the wings black.

It undergoes its metamorphosis in the abdomen of a living Bombus, and issues from between its rings.

Our fourth and last tribe, that of the Muscides, is distinguished from the three preceding ones by a very apparent, always membranous and bilabiate proboscis, usually bearing two palpi (the Phoræ alone excepted), susceptible of being entirely retracted within the oral cavity; and by a sucker composed of two pieces. The antennæ always terminate *en palette* with a lateral seta.

This tribe will comprise the genus

Musca, *Linnæus,*

Or that of the flies. Antennæ inserted near the front, palpi placed on the proboscis, and retiring with it into the oval cavity, and transverse nervures in the wings, characterise a first section of the Muscides, which will include eight principal groups or sub-tribes.

These groups are composed of various subgenera—we will merely particularise that of

Musca, properly so called, or the true Fly, where the abdomen is triangular, and the eyes are contiguous posteriorly, or closely approximated in the males.

Here come most of those flies whose larvæ feed on carrion, meat, &c.; others of the same subgenus inhabit dung. They all resemble soft whitish

worms without feet, thickest and truncated at the posterior extremity, and becoming gradually smaller towards the opposite one, which terminates in a point furnished with two hooks, with which they divide their aliment, and accelerate its decomposition. The metamorphosis of these insects is effected in a few days. The posterior extremity of the abdomen of the females is narrowed and prolonged in the manner of a tube or ovipositor, by which she can insert her eggs.

M. vomitoria, Lin. A large species; front fulvous; thorax black; abdomen glossy-blue with black streaks.

This insect enjoys the sense of smell to a high degree, announces its presence in our dwellings by a loud humming, and deposits its ova on meat. Deceived by the cadaverous odour arising from the Arum dracunculus, Lin., when in flower, it also leaves its eggs there. When the larva is about to become a pupa, it abandons the putrescent matters in which it has lived, which might then prove injurious to it, and penetrates, if possible, into the earth, or is metamorphosed in some dry and retired spot.

M. Cæsar, Lin. Body, a glossy golden-green; legs black. The female deposits her eggs on carrion.

M. domestica, Lin. The thorax of the common fly is of a cinereous-grey with four black streaks; abdomen blackish-brown spotted with black, and yellowish-brown above.

In the Diptera of which we have hitherto spoken, we have found a sucker received into the superior canal of a tubular sheath, more or less membranous, geniculate at base, most frequently terminated by two lips, and accompanied by palpi. The antennæ, except one subgenus or *Phora*, have always appeared to be inserted near the front. The larvæ of these Diptera, although susceptible of being hatched in the venter of the mother, live abroad and feed on various substances, vegetable or animal. These insects have formed our first general section, which is divided into five families. Those of the second differ in all these respects.

This second section will form our last family of the Diptera.

FAMILY VI.

PUPIPARA*.

These insects, at least the Hippoboscæ, were distinguished by Réaumur, under the analogous appellation of *Nymphipara*.

Their head, viewed from above, is divided into two distinct areæ or parts. One posterior, and more particularly composing the head, gives origin to the eyes and receives the other part in an anterior emargination. The latter is also divided into two portions, the posterior large and coriaceous, bearing the

* Born in the pupa state.

antennæ on its sides, and the other constituting the apparatus of manducation. The inferior and oral cavity of the head is occupied by a membrane; from its extremity issues a sucker arising from a little bulb or projecting pedicle, composed of two closely approximated threads or setæ, and covered by two coriaceous, narrow, elongated, and pilose laminæ which form its sheath.

The body is short, tolerably broad, flattened and defended by a solid skin almost of the consistence of leather. The head is more intimately united to the thorax than in the preceding families. The antennæ, always situated at the lateral and anterior extremities of the head, sometimes form a tubercle bearing three setæ, and sometimes little hairy laminæ. The eyes vary as to size; in some species they are very small.

The thorax presents four stigmata, two anterior and two posterior.

The wings are always distant and accompanied by halteres. Their edge is more or less fringed with cilia. The skin of the abdomen is formed of a continuous membrane, so that this part of the body is susceptible of being distended and of acquiring a considerable volume, as necessarily happens in those female Hippoboscæ, where the larvæ are hatched and continue to reside until the period of their transformation into pupæ. At this epoch the larvæ are produced in the form of a soft, white egg, almost as bulky as the maternal abdomen; the skin hardens and becomes a firm shell, at first brown, then black, round, and frequently emarginated at one end, and presenting a glossy plate or operculum which is finally detached in the manner of a cap to allow the egress of the perfect insect.

These insects, which have been called by some authors *Mouches-Araignées*, live exclusively on quadrupeds or birds, run very fast, and frequently sideways.

Some—*Coriaces*, Lat.,—have a very distinct head articulated with the anterior extremity of the thorax. They form the genus

Hippobosca, *Linnæus, Fabricius.*

The Hippobosca proper is furnished with wings; and has very distinct eyes occupying all the sides of the head; antennæ in the form of tubercles, with three setæ on the back.

H. equina, Lin. Brown mixed with yellowish. Found on horses and oxen, usually under their tail.

There are other subgenera.

The head of the other Pupipara—*Phthiromyies*, Lat., is very small or almost wanting. It forms a minute, vertical body near the anterior and dorsal extremity of the thorax.

They constitute the genus

Nycteribia, *Latreille.*

These insects have neither wings nor halteres, and resemble spiders still more than the preceding ones. They live on bats. Linnæus arranged one species, and the only one he knew, with the Pediculi.

FOURTH GREAT DIVISION OF THE ANIMAL KINGDOM.

ANIMALIA RADIATA.

The Radiated Animals, Zoophyta, or Zoophytes*, as they are termed, include a number of beings whose organisation, always evidently more simple than that of the three preceding divisions, also presents a greater variety of degrees than is observed in either of them, and seems to agree in but one point, viz. their parts are arranged round an axis and on one or several radii, or on one or several lines extending from one pole to the other. Even the Entozoa or Intestinal Worms have at least two tendinous lines, or two nervous threads proceeding from a collar round the mouth, and several of them have four suckers situated round a probosciform elevation. In a word, notwithstanding some irregularities, and some very few exceptions—those of the Planaria and most of the Infusoria—traces of the radiating form are always to be found, which are strongly marked in the greater number, and particularly in Asterias, Echinus, the Acalepha, and the innumerable host of the Polypi.

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* Neither of these denominations should be construed literally. There are some genera in this division in which the radiation is but slightly marked or even totally wanting, and it is only among the Polypi that we find that constancy and form of flowers which has caused them to receive the name of Zoophytes. These appellations, however, indicate our having reached the lowest part of the animal series, and that we have arrived at beings, most of which remind us more or less of the vegetable kingdom, even in their external forms—it is in this sense that I employ them.

[We here return to the Baron; the portion of the work written by M. Latreille, which commenced with the Crustacea, having terminated with the Dipterous Insects.

The nervous system is never very evident, and when traces of it have been apparently visible, it was also arranged in radii: most frequently, however, there is no appearance of it whatever.

There is never any true circulating system. The Holothuria are provided with a double vascular apparatus, one portion of it being attached to the intestines and corresponding to the organs of respiration, and the other merely serving to inflate the organs which supply the want of feet. The latter is only distinctly visible in Ursinus and Asterias. Through the gelatinous substance of the Medusæ we can see more or less complicated canals arising from the intestinal cavity; all this precludes the possibility of a general circulation, and in the great number of Zoophytes it is easily proved that there are no vessels whatever,

In some genera, such as Holothuria, Ursinus, and in several of the Entozoa, we observe a mouth and anus, with a distinct intestinal canal. Others have an intestinal sac, but with a single opening serving both for a mouth and anus. In the greater number there is merely a cavity excavated in the substance of the body which sometimes opens by several suckers; and finally there are some in which there is no mouth visible, and which can only be nourished by porous absorption.

The sexes of several of the Entozoa or Intestinal Worms can be distinguished. The greater number of the other Radiata are hermaphroditical and oviparous; some have no genital organs, and are reproduced by buds or division.

The compound animals, of which we have already seen some examples in the last of the Mollusca, are greatly multiplied in certain orders of the Radiata, and their aggregation produces trunks and expansions forming all sorts of figures. It is to this circumstance, together with the simple nature of the organisation in most of the species, and the radiating disposition of their organs which reminds us of the petals of flowers, that they owe their name of *Zoophytes*, or *Animal-plants*, by which we merely mean to express this apparent affinity, for as Zoophytes enjoy the sense of touch and the power of voluntary motion, mostly feed on matters which they have swallowed or sucked, and digest them in an internal cavity, they are certainly animals in every point of view.

The greater or less degree of complication in Zoophytes has occasioned their division into classes; but as all the parts of their organisation are not yet well known, those sections cannot be characterised with as much precision as those of the preceding divisions.

In Asterias and Ursinus, called ECHINODERMES by Brugiere on account of their spines, we find a distinct intestine floating in a large cavity, and accompanied by other organs, for generation, respiration, and a partial circulation. The Holothuriæ were necessarily united to them on account of the analogy of their internal organisation, which is perhaps still more complex, although they have no moveable spines on the skin.

The ENTOZOA or Intestinal Worms, which form the second class, have no very evident vessels in which a distinct circulation is carried on, or separate organs of respiration. Their body is usually elongated or depressed, and their organs arranged longitudinally. The difference in their system of digestion will hereafter probably cause them to be divided into two classes, a circumstance already indicated by our establishing two orders. In some we find an alimentary canal suspended in a true abdominal cavity, which is wanting in the others.

The third class comprises the ACALEPHA or Sea Nettles. They have neither true circulating vessels nor organs of respiration. Their form is usually circular and radiating, and their mouth is almost always their anus. They only differ from Polypi in the greater development of the tissue of their organs. The Acalepha Hydrostatica, which we place at the end of this class, when better known, will perhaps form a separate one; as yet however we can only conjecture the functions of their singular organs.

The POLYPI, which compose the fourth class, are those little gelatinous animals whose mouth surrounded with tentacula leads to a stomach sometimes simple and sometimes followed by intestines in the form of vessels. To this class belong those innumerable compound animals with a fixed and solid stem which were considered as marine plants.

The Thethyiæ and Sponges are usually placed at the end of this class, although Polypi have not yet been discovered in them.

The INFUSORIA, or the fifth and last class of the Zoophyta, are those minute beings whose existence we have only discovered by means of the microscope, and which swarm in stagnant waters. Most of them have merely a gelatinous body destitute of viscera, although we commence the series with more compound species possessed of visible organs of locomotion and a stomach: these also may hereafter constitute a separate class.

CLASS I.

ECHINODERMATA *.

The Echinodermata are the most complicated animals of this division. Invested with a well organised skin, frequently supported by a sort of skeleton, and armed with points, or moveable and articulated spines, they have an internal cavity in which distinct and floating viscera may be perceived. A sort of vascular system, which it is true does not extend throughout the body, but keeps up a communication with various parts of the intestine, and with the organs of respiration, which are generally very distinct. Threads are also seen in several, which may act as nerves, but which are never arranged with the regularity and fixed order of those in the animals of the two preceding divisions of the Invertebrata.

We divide the Echinodermata into two orders: those furnished with feet or at least with vesicular organs, so called on account of their fulfilling similar functions; and those in which they are wanting.

ORDER I.

PEDICELLATA.

The Pedicellata are distinguished by organs of motion exclusively peculiar to them. Their skin is pierced with a number of little holes, arranged in very regular series, through which pass cylindrical and membranous tentacula, each one terminated by a little disk which acts like a cupping-glass. That portion of these tentacula which remains within the body is vesicular; a humour is effused through their entire cavity, and is either propelled at the will of the animal into the exterior and cylindrical portion, which it distends, or returns to the interior vesicle, when the former sinks and becomes relaxed. It is by thus elongating and shortening their hundreds of little feet or tentacula, and by fixing them by their cup-like



* The Radiaires Echinodermes of M. de Lamarck.

extremities, that these animals effect their progressive motions. Vessels proceeding from these feet extend to trunks which correspond to their ranges, and which terminate near the mouth. They form a system distinct from that of the intestinal vessels observed in some species *.

Linnæus divided them into three very natural, but numerous genera, and composed of such various species, that they may be considered as forming three families. The

Asterias, *Linnæus*,

Or star-fish, have been so called because their body is divided into rays (generally five), in the centre of which, and underneath, is the mouth, that is also the anus.

The framework of their body is composed of small osseous pieces, variously combined, the arrangement of which merits examination. Their power of reproduction is very great, as they not only reproduce the rays which have been separately removed, but a single one with the central ray remaining will reproduce all the others; for this reason their figure is frequently irregular. In the

Asterias, *Lamarck*,

Or Asterias, properly so called, each ray has a longitudinal groove above, the sides of which are perforated by the little holes before-mentioned, for the transmission of the feet. The rest of the inferior surface is furnished with small and moveable spines. The whole surface is also pierced by pores, which allow a passage to tubes much smaller than the feet, that probably serve to absorb water, and convey it into the general cavity for a sort of respiration. On the middle of the body, and a little on one side, is a stony plate, with a corresponding internal canal, filled with a calcareous matter, which is thought to serve for the growth of the solid parts. Internally, we find a large stomach, immediately on the mouth, from which two cæca proceeds to each ray, ramifying like trees, and suspended (each) to a sort of mesentery. There are also two ovaries in each ray, and it appears to us that they possess the faculty of self-impregnation. A particular system of vessels is connected with their intestines, and another with their feet.

M. Tiedemann thinks that their nervous system consists in a very fine thread which surrounds the mouth, and sends a branch to each foot, which runs between those organs exteriorly, and gives off two twigs internally.

The osseous framework of each ray consists of a sort of column extending along the inferior surface, and composed of vertebræ articulated with each other, from which proceed the cartilaginous branches that support the exterior envelope. Between the roots of these branches are the holes that transmit the feet. Other osseous pieces, frequently furnished with moveable spines, are observed on the lateral edges of the branches in many species.

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* For details respecting the organisation of the Star-Fish, Ursini, and Holothuriæ, see the splendid anatomical Monograph of Tiedemann. Landshut, 1816, in folio.

Some of this genus have the figure of a pentagon with rectilinear sides, rather than that of a star. The radiation is only marked externally by the groove of the feet.

In others there is a slight re-entering angle in each side of the pentagon.

The sides of some are concave, which approximates them to a stellated figure.

In these various species the cæca and the ovaries are not so elongated as in most of those which have their rays elongated and separated by strongly marked re-entering angles.

Some species have more than five rays. Their cæca and ovaries are very short.

We should separate those species in which the rays are destitute of the longitudinal groove underneath for receiving the feet; generally, these rays are not hollow, and the stomach is not prolonged into them in the form of cæca, but its prominences remain in their intervals. Locomotion is principally effected by the curves and motions of the rays, and not by the feet, which are too few for that purpose.

Those which have five non-ramous rays round a central disk form the Ophiuræ of M. de Lamarck; but we should also distinguish

Those in which these rays are furnished on each side with moveable spines; the little fleshy feet also issue from each side between the origin of those spines.

Those in which there are none of these lateral spines, but where the rays are covered with imbricated scales, and resemble tails of serpents. The central disk, in each interval of its rays, and on the side where the mouth is placed, is marked by four holes which extend into the interior of the animal, serving perhaps for respiration, or, according to others, for the issue of the ova. Their only feet are in five short grooves, which form a star round the mouth.

The Gorgonocephalæ, Leach, called Euryales by M. de Lamarck, are those in which the rays are dichotomously divided. In some this division commences at the base of the rays, presenting the appearance of a bundle of serpents—they are commonly called Medusa's Head. There are two preceding holes at the base of each ray.

In others, however, this division only commences at the end of the ray, and is not often repeated.

We should also separate the

Alecto of Leach, called Comatula by M. de Lamarck. They have five large articulated rays, each of which is divided into two or three, bearing two ranges of articulated threads; these five rays are attached to a petrous disk also furnished, on the side opposite to the mouth, with one, two or three ranges of articulated threads without branches, shorter and more slender than the large rays, and by which the animal is said to fix itself. The sac which contains the viscera is situated in the centre of the large rays, opening by a stellated mouth and a second and tubular orifice which may be the anus.

It is in the vicinity of the Comatulæ that we must place the

Encrinus, *Guett.*

Which might be defined as Comatulæ with a prolonged disk and a multi-

articulated stem. The branches themselves are articulated and dichotomously ramose, bearing ranges of articulated threads, the stem being furnished with smaller ones at different heights; the mouth is in the centre of the rays, and the anus on one side.

Fossil Encrinites, however, are very numerous, and so various, that they have been divided into several subgenera, according to the composition of the central body placed on the summit of the stem and from which the large rays proceed.

The fossil productions, known by the names of *Entrochites*, are portions of the stem and branches of animals belonging to this genus.

Echinus, *Linnæus*,

The Echini, or Sea-Urchins, as they are termed, have the body invested by a shell or calcareous crust, composed of angular pieces which join each other exactly, and perforated by innumerable holes, for the transmission of the membranous feet, disposed in several very regular ranges. The surface of this crust is armed with spines, articulated on little tubercles, that move at the will of the animal, whose motions, conjointly with the feet situated between them, they effect. Other membranous tubes, much finer and frequently divided at the extremity, probably serve to convey water into the interior of their shell, and then to remove it. The mouth is provided with five teeth, set in an extremely complex, calcareous framework, resembling a pentagonal lantern, furnished with various muscles, and suspended in a large aperture of the shell. These teeth, which resemble long ribands, become indented inferiorly as fast as they are worn away at the point. The intestine is very long, and attached, spirally, to the interior parietes of the shell by a mesentery. A double vascular system extends along this canal, and partly on the mesentery; there are also particular vessels for feet. Five ovaries, situated round the anus, empty themselves by separate orifices; they form the edible portion of these animals.

The Echini chiefly feed on small shell-fish, which they seize with their feet. Their motions are very slow. Shells of Echini are very abundant in the ancient strata, principally those of chalk, where they are usually filled with silex.

The Echini should be divided into regular and irregular.

In the first,

Echinus, *Lamouroux*.—Cidaris, *Klein*.

Or Echinus properly so called, the shell is generally spheroidal, the mouth in the middle of the inferior surface, and the anus diametrically opposite. The little foramina are arranged in ten bands, approximated by pairs, that extend regularly from the mouth to the anus, like the meridian lines of a globe.

Certain species are furnished with large and stout spines of various forms, placed on large tubercles on their shell, the bases of which are surrounded by other but smaller spines.

It is among these species, as ascertained by M. Deluc, that we must place

those whose olive-like spines are often found petrified in chalk, and other ancient formations, called *pierres judaiques*.

The most common species, and particularly those of the coast of France, are merely furnished with slender spines, articulated on small tubercles that are much the most numerous.

The neighbouring species are distinguished with difficulty, by the greater or less approximation of the bands of holes, the equality or inequality of the tubercles, &c.

Holothuria, *Linnæus.*

The Holothuriæ have an oblong coriaceous body open at each end. At the anterior extremity is the mouth, surrounded with complicated tentacula susceptible of being entirely retracted. At the opposite end is the aperture of a cloaca in which the rectum and organ of respiration terminate, the latter in the form of an extremely ramified hollow tree, which is filled with water, or emptied, at the will of the animal. The mouth is edentate, or merely furnished with a circle of bony pieces; it receives saliva from certain sac-like appendages. The intestine is very long, variously flexed, and attached to the sides of the body by a mesentery; there is a sort of partial circulation in an extremely complex and double system of vessels, entirely restricted to the intestinal canal, and in a portion of the meshes with which one of the two arborescent organs abovementioned is intertwined. There also appears to be a very attenuated nervous cord round the œsophagus. The ovary is composed of a multitude of blind and partly ramous vessels, all terminating in the mouth by a small common oviduct; at the period of gestation they become enormously distended, and are filled with a red and grumous substance that appears to be the ova. Excessively extensible strings, inserted near the anus, appear to constitute the male organs of generation, and consequently these animals are hermaphrodites. When disturbed, it frequently happens that they contract so violently as to rupture and protrude their intestines.

The Holothuriæ may be divided according to the arrangement of their feet.

In some, they are all situated in the middle of the under part of the body, that forms a softer disk on which the animal crawls, turning up the two extremities, in which are the head and anus, that are narrower than the middle. The anus in particular terminates almost in a point. Their tentacula, when developed, are very large.

ORDER II.

APODA.

Our second order of the Echinodermata, or the Apoda, comprises but a small number of animals closely related to the Holothuriæ, but which want

the vesicular feet of the preceding order. Their body is invested with a coriaceous unarmed skin. Several points of their internal structure are not well understood. In

MOLPADIA, *Cuvier*,

As in Holothuria, we find a coriaceous body forming a thick cylinder open at both ends, and a tolerably similar internal organisation; but, independently of the want of feet, the mouth is destitute of tentacula, and is provided with an apparatus of bony parts, but less complicated than that of the Echini.

MINYAS, *Cuvier*,

Where the body is also destitute of feet, and open at both extremities; but its form is that of a spheroid depressed at the poles, and furrowed like a melon. I can find no armature about the mouth.

PRIAPULUS, *Lamarck*,

Where the body is cylindrical and transversely marked with deep annular rugæ, terminated anteriorly by an elliptical mass, slightly wrinkled longitudinally, perforated by the mouth, and posteriorly by the anus, from which issues a thick bundle of filaments which may be organs of generation. The interior of the mouth is provided with a great number of extremely sharp and horny teeth arranged in quincunx, and directed backwards; the intestine proceeds in a straight line from the mouth to the anus. The muscular system resembles that of the Holothuriæ.

LITHODERMIS, *Cuvier*,

Where the body is oval and compressed posteriorly; its surface has the appearance of being covered with a layer of stony granules, which form an extremely indurated crust. The mouth is surrounded with tentacula, and the intestines seem to be analogous to those of the Holothuriæ. They have no anus that I can perceive.

SIPUNCULUS, *Gmelin*.

The body is cylindrical and elongated, the skin thick and wrinkled in both directions. The mouth is provided with a sort of proboscis susceptible of retraction and protrusion by the action of large internal muscles, and the anus is more or less approximated to the base of that organ. The intestine proceeds from the mouth to near the opposite extremity, and then returns, twining spirally round itself. The only matters found in it are sand and fragments of shells. Numerous vessels appear to unite it with the external envelope, besides which a thread extends along one of its sides which may possibly be nervous. Two long bursæ, situated anteriorly, open exteriorly a little below the anus, and near this last orifice, internally, we sometimes find a bundle of ramous vessels which may be organs of respiration.



These animals are found in the sands of the sea, like the Arenicolæ and Thalassemæ, and like them are used as bait by the fishermen.

Bonellia, *Rolando.*

Here the body is oval and furnished with a proboscis, formed of a double lamina, susceptible of great elongation and forked at the extremity. The anus is at the opposite extremity of the body. The intestine is very long and frequently flexed, and near the anus we observe two ramified organs which may serve for respiration. The ova are contained in an oblong sac opening near the base of the proboscis. The Bonelliæ live at a considerable depth in sand, extending their proboscis to the water and even to the air above its surface when the tide is low.

Thalassema, *Cuvier,*

Where the body is oval or oblong and the proboscis in the form of a doubled lamina or bowl of a spoon, but not forked. The intestinal canal resembles that of the Bonelliæ. They have but one abdominal thread.

The Thalassemæ are divided into

Thalassema proper,

Where these two hooks are placed far forwards, and the posterior extremity is destitute of setæ; and

Echiurus,

Where the posterior extremity is furnished with transverse ranges of setæ.

Sternaspis, *Otto,*

Where, in addition to the setæ of the Echiuri, we observe anteriorly a slightly corneous disk surrounded with cilia.

CLASS II.

ENTOZOA, *Rudolphi.*

The Entozoa or Intestinal Worms are remarkable, because the greater number inhabit the interior of other animals, and there only can propagate. There is scarcely a single animal that is not the domicil of several kinds, and those which are observed in one species are very rarely found in others. They not only inhabit the alimentary canal and the ducts that empty into it, such as the hepatic vessels,

but even the cellular tissue, and the parenchyma of the most completely invested viscera, such as the liver and brain.

The difficulty of conceiving how they get there, added to the fact of their never having been seen out of living bodies, has induced some naturalists to believe that they are spontaneously engendered. We now know that most of them not only produce ova or living young ones, but that, in many, the sexes are separate, and coition ensues as among other animals. We are then compelled to believe, that they propagate their race by germs sufficiently minute to be transmitted through the narrowest passages, and that frequently those germs are contained in animals at birth.

In the Intestinal Worms we find neither tracheæ, nor any other organ of respiration, and they must receive the influence of oxygen through the medium of the animal they inhabit. They present no trace of a true circulation, and we merely perceive vestiges of nerves so extremely obscure, that many naturalists have doubted their existence *.

When those characters are found united in an animal with a form similar to that of this class, we place it here, although it may not inhabit the interior of another species.

The injury caused by worms to animals, in which they become excessively multiplied, is well known. The most efficacious agent for destroying those of the alimentary canal seems to be animal oil mixed with spirits of turpentine †.

We will divide the Entozoa into two orders, which are perhaps sufficently different in organisation to form two classes, if we had the observations requisite to determine their limits. These orders are the

ENTOZOA NEMATOIDEA, *Rudolphi,*

Which have an intestinal canal floating in a distinct abdominal cavity, a mouth and anus; and the

ENTOZOA PARENCHYMATA ‡,

Where the parenchyma of the body contains obscurely terminated viscera, most commonly resembling vascular ramifications, and sometimes not visible.

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* For the anatomy of these Worms, besides the Entozoa of Rudolphi, see the Mem. of M. Otto, Soc. Nat. Berl., 1816, and the work of M. J. Cloquet.

† See Chabert, Traité des Maladies Vermineuses, and Rudolphi, i. p. 493.

‡ They comprise the four last orders of Rudolphi.

ORDER I.

NEMATOIDEA, *Rudolphi**.

This order comprises those whose external skin, more or less furnished with muscular fibres, and usually striated transversely, contains an abdominal cavity in which is a distinct intestinal canal, extending from the mouth to the anus, and where we generally observe distinct organs in each of the sexes. The intestine is connected with the neighbouring parts, and the general envelope of the body by numerous threads, considered by some writers as vessels for the conveyance of the nutritious fluid, and by others as tracheæ, but without any proof of the fact. It is impossible to detect any true circulation in these animals, but in several there appear to be one or two nervous cords arising from a ring which surrounds the mouth, and extending the whole length of the body along the internal surface of the envelope.



The intestine is generally straight, and tolerably wide; the œsophagus is frequently smaller, and in some species we remark a larger and more vigorous stomach. The internal organs of generation consist of extremely long vessels, containing the semen or the ova, which open at different points, according to the genus.

Filaria, *Linnæus*,

Where the body is elongated, slender, filiform, and perforated at the anterior extremity by a round oral aperture. The Filariæ in their external appearance are very similar to the Gordii. They are chiefly found in those cavities of animals which do not open externally, such as the cellular membrane, and even in the thickness of the membranes and the parenchyma of the viscera; there we sometimes find them in bundles and countless numbers, enveloped in species of capsules. They are found in insects and their larvæ, and even in the visceral cavity of several Mollusca. The most celebrated species of this genus

F. medinensis, Gm.; Encyc. XXXIX, 3 (The Guinea Worm), is very common in hot climates, insinuates itself under the skin of man, generally that of the leg, where, if credence be given to the reports of certain authors, it acquires a length of ten feet and more, may remain there several years without producing violent pain, or cause intense agony and excite convulsions, according to the nature of the part it attacks. When it shows itself externally, it is seized and extracted very slowly for fear of breaking it. It is about as

* This order, with the exception of the two last genera, constitutes the Entomozaire Apodes Oxycephales of M. de Blainville.

thick as the barrel of a pigeon's quill. Its pointed and hooked tail constitutes its distinguishing character*.

Trichocephalus,

Where the body is round, thickest posteriorly, and as slender as a thread anteriorly. This slender part is terminated by a round mouth. The most common species is the

T. dispar. Rud.; Gœtz., VI, 1, 5; Encyc., XXXIII, 1, 4. From one to two inches in length, of which the thickest portion forms but the third. This part, in the male, is spirally convoluted. It is straighter in the female, and simply perforated at the extremity.

It is one of the most common worms in the great intestines of man, where, in certain diseases, it becomes prodigiously multiplied †.

Naturalists have distinguished from the preceding the

Ascaris, *Linnæus.*

The Ascarides have a round body, attenuated at each extremity, and a mouth furnished with three fleshy papillæ, between which an extremely short tube occasionally projects. This genus is very numerous in species which are found in all kinds of animals. Those which have been dissected presented a straight intestinal canal, and the females, by far the greater number, exhibited an ovary with two branches, several times the length of the body, opening externally by a single oviduct, near the anterior fourth of the total length of the animal.

Two white threads, one of which extends along the back, and the other along the belly, are considered by Messrs. Otto and Cloquet as the nervous system of these animals; two other and thicker threads, one on the right and the other on the left, are considered by some as muscular, and by others as vascular, or even as tracheæ.

Strongylus, *Muller,*

Where the body is round, and the anus of the male is enveloped by a sort of bursa, variously shaped, from which issues a little thread that appears to be an organ of generation. These two last characters are wanting in the female, which has sometimes caused her to be taken for an Ascaris.

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* For the other Filariæ, see Rud., Hist., ii. 57, Syn., p. 1.

N.B. Rudolphi, in his Synopsis, has suppressed the genus Hamularia, which was characterised by two little oval filaments. On examination, they were found to be the male organs of generation, placed at the posterior extremity.

† For the Trichocephali of animals, see Rud, Ent., ii. 86, and Syn., p. 16.

ORDER II.

PARENCHYMATA.



The second order of the Entozoa comprises those species in which the body is filled with a cellular substance or even with a continuous parenchyma, the only alimentary organ it contains being ramified canals, which distribute nourishment to its different points, and which, in most of them, originate from suckers visible externally. The ovaries are also enveloped in this parenchyma or that cellulosity. There is no abdominal cavity, or intestine properly so called; the anus is wanting, and if we except some equivocal vestiges in the first families, there is nothing to be found which bears a resemblance to nerves.

We may divide this order into four families.

FAMILY I.

ACANTHOCEPHALA.

The Parenchymata of this family attach themselves to the intestines by a prominence armed with recurved spines, which also appears to act as a proboscis. They form the single genus

ECHINORHYNCHUS, *Gmelin*,

Where the body is round, sometimes elongated, and sometimes in the form of a sac, provided anteriorly with a prominence in the form of a proboscis armed with little hooks bent posteriorly, and susceptible of being retracted or protruded by the action of particular muscles. At its extremity we sometimes observe a papilla or pore which may be an organ of absorption, but it is certain that if the animal be plunged into water it becomes universally distended, and absorbs that liquid through the whole surface, on which it is thought we can discover a network of absorbent vessels. No other parts that can be compared to intestines are visible internally than two slightly elongated cæca attached to the base of the tubiform prominence; a vessel extends throughout its length on each side. A thread that runs along the inferior face of the animal is considered by M. de Blainville as its nervous system; but neither Rudolphi nor Cloquet coincide with him. Certain species have a distinct oviduct; in others the ova are disseminated throughout the cellulosity or parenchyma of the body. The males are provided with a little bladder at the end of the tail, and very distinct internal vesiculæ seminales. We may believe that they fecundate the ova after they are extruded.

These worms cling to the intestines by means of their proboscis, and frequently penetrate through them, so that individuals are sometimes found in the thickness of their tunics, and even in the abdomen, adhering to their external parietes.

FAMILY II.

TREMADOTEA, *Rudolphi.*

Our second family comprises those which are furnished underneath the body, or at its extremity, with organs resembling cupping-glasses, by which they adhere to the viscera.

They may all be united in one genus, or the

Fasciola, *Linnæus,*

Which may be subdivided in the following manner, according to the number and position of their organs of adhesion.

Festucaria, *Schr.*—Monastoma, *Zed.*,

Where there is but one of those organs, sometimes at the anterior extremity and sometimes underneath the same end. Found in various birds and fishes.

Strigea, *Abild.*—Amphistoma, *Rudolphi*,

Where there is a cup at each extremity. Found in various quadrupeds, birds, &c.

To this subgenus we must probably approximate the

Caryophyllæus, *Blainville*,

Where the head is dilated, fringed, and furnished underneath with a bilabiate sucker, not easily perceived. A second and similar sucker has been occasionally seen underneath the tail.

One species is known, which inhabits various fresh-water fishes, and particularly the bream.

Distoma, *Retz and Zed.*,

Where there is a sucker at the anterior extremity of the mouth, and a cup, a little posterior to it, on the venter.

The species are very numerous, and some are found even in the plaited membrane of the eyes of certain birds. Others, however, appear to inhabit fresh and salt water. The most celebrated is

D. hepatica; Fosciola hepatica, Lin. It is very common in the hepatic vessels of sheep, but is also found in those of various other Ruminantia, and of the hog, horse, and even of man. Its form is that of a small oval leaf, pointed posteriorly, with a narrowed portion anteriorly, at the end of which is the first sucker, which communicates with a sort of œsophagus, from which arise canals that ramify throughout the body, conveying the bile on which this

animal feeds. Behind the sucker is a little retractile tentaculum, and posterior to that, the second sucker; extremely flexuous vesiculæ seminales fill up the centres of the leaf. The ovary, which is found in every individual, is set in the intervals of the intestines, and the ova issue through a flexuous canal that opens exteriorly by a small hole.

The species that infest sheep become greatly multiplied when they graze in low and wet grounds, rendering them dropsical, and finally killing them.

M. Rudolphi, under the name of Echinostoma, makes a division of those species which have a slight tubercle or swelling, anteriorly armed with hooks.

Holostoma, *Nitz*,

Where one half of the body is concave, and so arranged as to act altogether like a cup. Their orifices appear to be similar to those of Distoma.

They inhabit certain birds. One species is found in the fox. In

Polystoma, *Zed.*,

Or rather Hexastoma, the body is depressed, smooth, and furnished with six cups arranged in a transverse line, under the posterior margin. The mouth appears to be at the opposite extremity.

They have been found in the urinary bladder of frogs, in the ovary of woman, on the branchiæ of some fishes, and in the nasal cavity of certain tortoises.

Cyclocotyle, *Otto*,

Where there are eight cups forming an almost complete circle, under the hind part of the body, which is broad; there is a small proboscis anteriorly.

FAMILY III.

TÆNIOIDEA.

In our third family of parenchymatous intestinal worms, we place all those species in which the head is provided with two or four suckers placed around its middle, which is itself sometimes marked with a pore, and sometimes furnished with a little proboscis, naked or armed with spines. Sometimes there are four little trunks thus armed.

The most numerous genus is

Tænia, *Linnæus*,

The body of the *Tape-worm* is often excessively elongated, flat, composed of joints more or less distinctly marked, and narrowed anteriorly, where we generally find a square head hollowed by four small suckers.

Observers have thought that they could perceive canals which arose from these suckers, and crept along the margin of the joints of the body. Each of

the latter has one or two pores differently situated, according to the species, which appear to be the orifices of ovaries that are placed in the thickness of the joints, where they are sometimes simple, and at others ramous. The Tæniæ are among the most cruel enemies of the animals in which they are developed, and which are apparently exhausted by them.

In some, there is no projecting part in the four suckers. Such in Man is the

T. lata, Rud.; *T. vulgaris*, Gm.; Gœtz., XLI, 5—9. (The Common Tape-worm.) The joints are broad, short, and furnished with a double pore in the middle of each side. It is very frequently twenty feet in length, and it has been found upwards of a hundred. The large ones are nearly an inch wide, but the head and anterior portion of the body are always very slender. This species is extremely injurious and tenacious. The most violent remedies frequently fail to expel it.

In others, the prominence between the suckers is armed with little radiating points. Such is the

T. solium, Lin.; Gœtz., XXI, 1—7; Encyc, XL, 15—22, and XLI, 1—7; *Ver solitaire* of the French. Its joints, the anterior ones excepted, are longer than they are wide, and have the pore placed alternately on one of their edges. It is usually from four to ten feet in length, but much larger ones are sometimes met with. The vulgar idea that but one of these animals is found at a time in the same individual is very far from being true. Its detached joints are styled *cucurbitini*. It is one of the most dangerous of the intestinal worms and the most difficult to expel.

From these ordinary Tæniæ, on account of the form of their head, are distinguished the

Tricuspidaria, *Rudolphi*,

Now called Trianophora by the same author, where the head, divided as it were into two lips or lobes instead of suckers, has two tri-pointed spinuli or stings on each side.

Tentacularia, *Bosc.*,

Only differ in consequence of the tentacula being unarmed.

Naturalists have also distinguished from the ordinary Tæniæ those, which, with a similar head, that is one with four suckers, have the body terminated posteriorly by a bladder. Their joints are not as distinctly marked as in the preceding ones. The genus

Cysticercus, *Rudolphi*,

Vulgarly termed *Hydatids*, is composed of those in which the bladder supports but a single body and one head. They are particularly developed in the membranes and cellulosity of animals.

Scolex, *Muller*,

Where the body is round, pointed behind, extremely contractile, and terminated before by a sort of variable head, round which are two or four

suckers, sometimes resembling ears or ligulæ. Those that are known are very small and inhabit fishes.

FAMILY IV.

CESTOIDEÆ.

The fourth family comprises those which are destitute of external suckers. But one genus is known.

Ligula, *Bloch.*

Of all the Entozoa, these appear to be the most simply organised. Their body resembles a long riband; it is flat, obtuse before, marked with a longitudinal stria, and finely striated transversely. No external organ whatever is perceptible, and internally we find nothing but the ova, variously distributed in the length of the parenchyma.

They inhabit the abdomen of certain birds, and particularly of various fresh-water fishes, enveloping and constricting their intestines to such a degree as to destroy them. At certain periods they even perforate the parietes of the abdomen to leave it.

CLASS III.

ACALEPHA.

Our third class comprises Zoophyta, which swim in the waters of the ocean, and in whose organisation we can still perceive vessels, which, it is true, are generally mere productions of the intestines excavated in the parenchyma of the body.

ORDER I.

SIMPLICIA.

The simple Acalepha float and swim in the ocean by the alternate contractions and dilatations of their body, although their substance is gelatinous and without any apparent fibres. The species of vessels observed in some of them are hollowed out of their gelatinous substance; they frequently and evidently originate from the stomach, and do not occasion a true circulation.



MEDUSA, *Linnæus.*

The Medusæ are furnished superiorly with a disk more or less convex, resembling the head of a mushroom, and called the *umbella*. Its contractions and dilatations assist the locomotion of the animal. The edges of this umbella, as well as the mouth, or the suckers more or less prolonged into pedicles which supply the want of it, in the middle of the inferior surface, are furnished with tentacula of various forms and very different sizes. These various degrees of complication have given rise to numerous divisions.

We will designate by the general name of

MEDUSA,

Or Medusa proper, those which have a true mouth in the middle of the inferior surface, either simply open at the surface or prolonged into a pedicle.

Under the name of

ÆQUOREA,

We may reunite those in which this mouth is simple and not prolonged, nor furnished with arms.

When there are no tentacula round the umbella they constitute the PHORCYNIA of Lamarck.

When the circumference of the umbella is furnished with tentacula, we have the ÆQUOREA proper—ÆQUOREA of Péron—one of the most numerous of all the subgenera, particularly in the seas of hot climates.

Certain species are remarkable for having their inferior surface covered with laminæ, and others—FOVEOLIA, Péron—for little fossulæ, which are placed round the circumference of the umbella.

We might also unite under the name of

PELAGIA,

Those in which the mouth is prolonged into a peduncle, or is divided into arms.

In all these subgenera there are no lateral cavities, but in a much greater number of these Medusæ with a simple mouth, we find, in the thickness of the umbella, four organs formed of a plaited membrane, which at certain seasons are filled with an opaque substance, and which appear to be ovaries. They are usually placed in as many cavities opening on the inferior surface, or on the sides of the pedicle, and which have been erroneously (in my opinion) taken for mouths, because little animals are sometimes entangled in them. Others consider them as organs of respiration, but that function is most probably exercised by the edges of the umbella. The tentacula, whether situated on the margin of the umbella or round the mouth, vary, not only according to the species, but to the age of the animal.

We will unite, under the name of

CYANEÆ, *Cuvier,*

All the Medusæ with a central mouth and four lateral ovaries.

We have given the general name of RHIZOSTOMA to that portion of the great genus Medusa which comprises species that have no mouth opening in the centre, and that appear to live by the suction exercised by their pedicles or tentacula. They have four or more ovaries. The

RHIZOSTOMA proper,

Includes those which are furnished with a central pedicle more or less ramified according to the species.

The vessels arising from the small ramifications of the pedicles unite in a cavity of its base, whence branches proceed to all parts of the umbella.

The most common species (*R. bleu*, Cuvier) is found along the French coast at low water: the umbella is sometimes nearly two feet in width. The pedicle is divided into four pairs of arms almost infinitely forked and toothed, each pedicle being furnished at the base with two auricles that are also dentated; a very fine network of vessels extends round the umbella in the the thickness of its margin, this is the *Pulmo Marinus* of Aldrovand.

According to the observations of Audouin and Milne Edwards, these Medusæ seem to live much in each others society, at least they are always met with in great numbers, and swimming in the same direction with their bodies obliquely inclined.

The CEPHEÆ of Peron are only distinguished from the other Rhizostoma by having filaments intermixed with the dentations of the pedicle, while the CASSIOPEÆ, which have no pedicle, properly so called, have their arms, usually eight in number, rising immediately from their inferior surface, these are sometimes ramous.

In some other species which have no central mouth, we find none of those numerous ramifications in the pedicle, neither do we find open cavities for lodging the ovaries; these might be united under the name of

ASTOMA.

In some, however, such as the LYMMNOREA and FOVONIER of Peron, we still find a large pedicle furnished on each side with fibrous filaments, which may act as suckers; while others, as the GERYONIA of Peron, are even destitute of these filaments, but have an infundibuliform membrane at the extremity of the pedicle, from the bottom of which vessels seem to arise that ascend into the pedicle and spread out through the umbella, one of these *Medusa Proboscidalis*, Forskahl, is found on the shores of the Mediterranean.

In the ORITHYIA, Peron, this membrane is wanting, although it is possible that mutilated Geryoniæ, which are often in that condition, may have been mistaken for Orithyiæ. In the

BERENIX, *Peron*,

We find there is no pedicle whatever, but the inferior surface appears to be provided with little suckers along the track of the vessels: while in the

Eudora, *Peron.*

Even these suckers are invisible, the two surfaces being perfectly smooth and without any apparent organs, One of these species, *Eudora Moneta*, is found in the Mediterranean. It is about the size of a five franc piece, and is so called by the people on the coast.

When these simple animals become more concave, their inferior surface becomes an interior one, and may be considered as a true stomach. These form the Carybdea, Peron.

We should also separate from the Medusæ, certain genera united with them by Linnæus. Such are the

Beroe, *Müller.*

Where the body is globular, and furnished with salient ribs covered with filaments resembling a sort of lace, extending from one pole to the other, and in which ramifications of vessels are perceptible, and a kind of motion, resembling that of a fluid. The mouth is one extremity, in those which have been examined; they lead into a stomach that occupies the axis of the body; and on the sides are two organs, probably analogous to those we have styled ovaries in the Medusæ.

Near the Beroes we must also place the

Cestum, *Lesueur.*

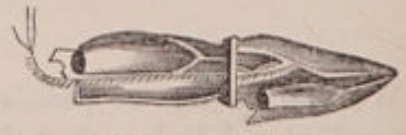
A very gelatinous rib, and having one margin furnished with a double row of cilia. In the middle of the inferior margin is the mouth, a wide aperture opening into a stomach placed transversely in the thickness of the rib, and terminating by a very small anus. This animal may be compared to a Calleanira with two ribs, and excessively elongated wings.

The Porpita and Velella, Lamarck, which were formerly joined with the Medusæ, might also constitute a small family in this order, on account of the internal cartilage which supports the gelatinous substance of the body.

ORDER II.

HYDROSTATICA.

The Hydrostatic Acalepha are known by one or more bladders usually filled with air, by means of which they suspend themselves in their liquid element. Excessively numerous and variously shaped appendages, some of which probably serve as suckers,



and the others perhaps as ovaries, and some longer than the rest as tentacula,

are attached to these vesicles and compose the whole apparent organisation of these animals. They have no apparent mouth, at least none which can be decidedly considered as such.

PHYSALIA, *Lamarck.*

The Physaliæ resemble an extremely large oblong bladder, elevated superiorly into an oblique and wrinkled crest, and furnished beneath, near one of its extremities, with numerous, cylindrical, fleshy productions, variously terminated, that communicate with the bladder. Those in the middle give origin to more or less numerous groups of little filaments; the lateral ones are merely divided into two threads, one of which is frequently very long. There appears to be an extremely small orifice in one of the extremities of the bladder, but internally no other intestine is found, but another bladder with thinner parietes, and cæca that partly extend into the cavities of the crest. There is no nervous, circulating, nor glandular system. The animal swims on the surface of the sea when it is calm, employing its crest as a tail. When living, it is also furnished with extremely long filaments, more slender than the others, which are sprinkled, as it were, with pearls or drops. Its touch is said to sting and burn like that of the sea-nettle.

They are found in all the seas of hot climates.

PHYSSOPHORA, *Forskahl.*

These Acalepha are evidently allied to the Physaliæ, but their bladder is proportionally much smaller, has no crest, and is frequently accompanied by lateral bladders; their various and numerous tentacula are suspended vertically under the bladder, like a garland or cluster. In

PHYSSOPHORA, *Peron,*

Or Physsophora properly so called, between the superior bladder and the tentacula are other bladders placed side by side, or one on another, sometimes of an irregular figure, and sometimes polyedrous, forming, by their union, prisms or cylinders. The tentacula, partly conical, partly cylindrical, and partly formed by groups of threads or globules, and finally, partly filiform and susceptible of considerable elongation, form a cluster or garland at the inferior extremity.

HIPPOPUS, *Quoy and Gaymard,*

Where there are merely lateral vesicles, almost semicircular, or shaped like the foot of a horse, and crowded into two ranges, thus forming a sort of spike, comparable to that of certain grasses, from which also depends a kind of garland that crosses all the preceding parts. The united contraction of these vesicles enable the animal to move rapidly.

It is directly after these hydrostatic Acalepha that we may place the

DIPHYES, *Cuvier.*

A very singular genus, where two different individuals are always found together, one encased in a cavity of the other, but susceptible of being sepa-

rated without destroying the life of either. They are gelatinous, diaphanous, and move nearly in the manner of a Medusa. The *receiver* produces from the bottom of its cavity a chaplet which traverses a semi-canal in the *received*, and appears to be composed of ovaries, tentacula, and suckers, like those of the preceding genera.

This genus has been divided by Messrs Quoy and Gaymard according to the relative form and proportions of the two individuals.

Thus in

DIPHYES proper,

The two individuals are almost similar and pyramidal, with some points round their aperture which is at the base of the pyramid.

In CALPES the received is still pyramidal, but the receiver is very small and square.

In ABYLES the received is oblong or oval, and the receiver somowhat small and bell-shaped.

In CUBOIDES the received is small and bell-shaped, the receiver much larger and square.

In NAVICULA the received is bell-shaped; the receiver is large, but has the figure of a wooden shoe.

There are several other combinations.

CLASS IV.

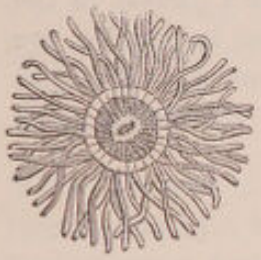
POLYPI *.

OUR fourth class of the Radiata or Zoophytes has been thus named because the tentacula which surround their mouth give them a slight resemblance to an Octopus called *Polypus* by the ancients. The number and form of these tentacula vary. The body is always cylindrical or conical, frequently without any other viscus than its cavity, and frequently also with a visible stomach, to which adhere intestines or rather vessels excavated in the substance of the body like those of the Medusæ; in this latter case we usually find ovaries also. Most of these animals are capable of forming compound beings, by shooting out new individuals, like buds. They also, however, propagate by ova.

* This class of animals, although nearly at the end of the series, is one of the largest, and certainly the most singular of the whole. Such is the enormous accumulation of the stony envelopes formed by them in certain seas, that islands are produced, coasts extended, and harbours blocked up by them. The late lamented M. de Lamarck has even hazarded the idea, that the calcareous strata of the globe may have been produced by them. Polypi

ORDER I.

CARNOSI.



The first order comprises fleshy animals that usually fix themselves by their base, several of which, have the power of crawling on that base, or even of detaching it altogether, and swimming or suffering themselves to be carried away by the current. Most commonly, however, they merely expand the oral aperture, which is also the anus. It is surrounded with a greater or less number of tentacula, and opens into a stomach or cul-de-sac. Between this internal sac and the external skin we find a tolerably complex, but still obscure organisation, chiefly consisting of fibrous and vertical leaflets, to which the ovaries, that resemble tangled threads, are attached. The intervals of these leaflets communicate with the interior of the tentacula, and it appears that water penetrates into and issues from them by small orifices in the circumference of the mouth; the Actiniæ, at least, sometimes ejaculate it in this manner *.

Actinia, *Linnæus.*

The fleshy body of these Polypi is frequently ornamented with bright colours, and exhibits numerous tentacula placed round the mouth in several ranges, like the petals of a double flower, and hence their common name of Sea-Anemonies. They are extremely sensible to the influence of light, and expand or close in proportion to the fineness of the day. When they retract their tentacula, the opening through which those organs pass contracts and closes over them like the mouth of a purse.

Their power of reproduction is scarcely inferior to that of the Hydræ; parts that have been amputated shoot out again, and the animal may be multiplied by division. Their usual mode of generation is viviparous. The little Actinæ pass from the ovary into the stomach and issue from the mouth. These Zoophytes, when hungry, dilate their mouth to a great extent. They devour all sorts of animals, especially Crustacea, shell-fish, and small fishes, which they capture with their tentacula and soon digest.

The Discosoma, Rupp., are Actinæ in which the tentacula are almost reduced to nothing by their shortness.

Zoanthus, *Cuvier.*

The same fleshy tissue and arrangement of the mouth and tentacula as in the Actinæ, and a nearly similar organisation; but these animals are united

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were formerly considered as stony plants. Imperati (1699) was the first who doubted their vegetable nature, and Trembley's observations on the Hydra (1740) put the question at rest. Since that period, our knowledge of them has been considerably increased by the labours of Ellis, Boccone, Cavolini, Lamouroux, &c. &c.—*Ed.*

* See Spix., Ann. du Mus., XIII., xxxiii., f. 1—5.

in more or less considerable number on a common base, sometimes in the form of a creeping stem, and sometimes having a broad surface.

Lucernaria, *Muller.*

The Lucernariæ should apparently be approximated to the Actinæ, but their substance is softer; they fix themselves to fuci and other marine bodies by a slender pedicle, and their superior portion dilates like a parasol, in the centre of which is the mouth. Numerous tentacula united in bundles are arranged round its edges. Between the mouth and these same edges are eight organs resembling cæca, proceeding from the stomach and containing a red and granulated substance.

ORDER II.

GELATINOSI.

The gelatinous Polypi, unlike the preceding ones, are not invested with a firm envelope, neither is there a ligneous, fleshy, nor corneous axis in the interior of their mass. Their body is gelatinous and more or less conical; its cavity supplies the want of a stomach.

Hydra, *Linnæus.*

Of all the animals of this class, these are reduced to the greatest degree of simplicity. A little gelatinous horn, whose edges are provided with filaments that act as tentacula, constitutes their whole apparent organisation. The microscope discovers nothing in their substance but a diaphanous parenchyma filled with more opaque granules. Notwithstanding this, they swim, crawl, and even walk by alternately fixing their two extremities in the manner of leeches or of the caterpillars called Geometræ. They agitate their tentacula and use them for seizing their prey, which can be seen being digested in the cavity of their body. They are sensible to the action of light and seek it, but their most wonderful property is that of being constantly reproduced by the indefinite excision of their parts, so that we can multiply them at will by means of division. Their natural increase is by shoots which push out from various points of the body of the adult, and which at first resemble branches.



Corine, *Gærtner.*

The Corines have a fixed stem terminated by an oval body, of a firmer consistence than that of the Hydræ, open at the summit, and completely covered with little tentacula. Some of them carry their ova at the inferior part of the body.

CRISTATELLA, *Cuvier*,

Where there is a double range of numerous tentacula on the mouth, curved into a half moon, forming a plume of that figure, which attracts the nutritious molecules by their regular motion. These mouths are placed on short necks attached to a common gelatinous body, which proceeds in the usual manner of a hydra. These animals are found in stagnant waters in France. To the naked eye they seem to be small spots of mould.

VORTICELLA,

Where the stem is fixed, frequently ramous and much divided, each branch terminating by a body shaped like a bell or horn. From the aperture project two opposing groups of filaments which are constantly in motion, and that attract nutritious molecules. The species are very numerous in fresh water, and are generally too small to be perceived without a microscope. They form bushes, arbuscles, plumes, &c. &c.

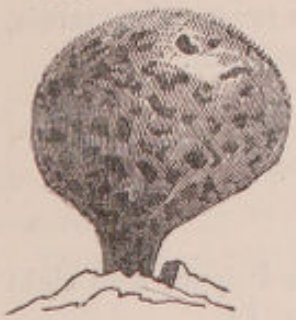
PEDICELLARIA.

The Pedicellariæ are found between the spines of the Echini, and are considered by various authors as organs of these animals; most probably however they are Polypi, which there seek an asylum. They consist of a long slender stem, which terminates by a horn, furnished at its extremity with tentacula, sometimes filiform and sometimes foliaceous.

ORDER III.

CORALLIFERI.

THE Coralliferi constitute that numerous suite of species which were long considered as marine plants, and of which the individuals are in fact united in great numbers to constitute compound animals, mostly fixed like plants, either forming a stem or simple expansions, by means of a solid internal substance. The individual animals, more or less analogous to the Actiniæ or Hydræ, are all connected by a common body, and are nourished in common, so that what is eaten by one goes to the nutrition of the general body, and of all the other Polypi. Their volition is even in common, at least it is certainly so in the free species, such as the Pennatulæ, which are seen swimming by the contractions of their stems, and the combined motions of their Polypi.



The name of *Polypiers* has been given to the common parts of these compound animals; they are always formed by deposition, and in layers like the ivory of teeth, but are sometimes on the surface, and sometimes in the interior of the compound animal. This difference of position has given rise to the following families.

FAMILY I.

TUBULARII.

Those of the first inhabit tubes of which the common gelatinous body traverses the axis, like the medulla of a tree, and that are open, either on the summit or sides, to allow the passage of the Polypi.

Their more simple Polypi apear to be chiefly analogous to the Hydræ and Cristatellæ.

Tubipora, *Linnæus.*

Simple tubes of a stony substance, each containing a Polypus. These tubes are parallel, and united from space to space by transverse laminæ, which has caused them to be compared to the pipes of an organ.

It appears that we must approximate to the Tubipora certain fossil Coralliferi (*Polypiers*) also composed of simple tubes, such as the Catenipora, Lam., where the tubes are deposited in lines that intercept vacant meshes; the Favosites, id., composed of crowded hexagonal tubes, &c.

Tubularia, *Linnæus,*

Simple or branched tubes of a horny substance, from the extremities of which issue the Polypi.

The Polypi of the fresh water Tubulariæ—Plumatella, Bosc.—seem to be closely approximated to the Cristatellæ by the disposition of their tentacula.

Certain species are found in France, that creep over the plants of stagnant waters.

Tubularia Marina.

The Polypi of those that inhabit salt water have two ranges of tentacula, the outer one forming radii, and the inner turning up into a tuft.

Tibiana, *Lamouroux.*

Zigzag tubes presenting a small open branch at each angle.

Cornularia, *Lamarck,*

Where the tubes are conical, from each of which issues a Polypus with eight dentated arms, like those of the Alcyoniæ, Gorgoniæ, &c. In

Anguinaria, *Lamarck,*

The tubes are small, cylindrical, and adhere to a creeping stem, each one opening laterally, and near the extremity for the passage of a Polypus. In

CAMPANULARIA, *Lamarck*,

The extremities of the branches through which the Polypi pass are widened and bell-shaped.

Lamouroux separates them into CLYTIA, where the stems are scandent:

And LAOMEDA where they are not; the bells also are smaller and the branches shorter.

SERTULARIA, *Linnæus.*

The Sertulariæ have a corneous stem, sometimes simple, sometimes ramous, on the sides of which are cells, extremely various in form, that are occupied by the Polypi, all connected with a gelatinous stem that traverses the axis, like the medulla of a tree. They propagate by ova or buds, which are developed in cells larger than the rest, and of a different form.

The various directions of their cells have caused them to be subdivided.

AGLAOPHENIA, *Lamouroux*—PLUMULARIA, *Lamarck*,

Where the little cells are arranged on one side only of the branches.

AMATIA, *Lamouroux*—SERTULARIA, *Lamarck*,

Where they are united, in certain places, like the pipes of an organ.

We might distinguish those species in which the cells, thus disposed, form a spiral line round the stem.

ANTENNULARIA, *Lamarck*—CALLIANYRA, *Lamouroux*,

Where the cells form horizontal rings round the stem.

Thus the name of

SERTULARIA proper

Becomes restricted to those in which the cells are placed on both sides of the stem, either opposite or alternately. The first are even again separated by Lamouroux under the name of Dynamenes.

Where the cells are extremely small we have his genus THOEA.

FAMILY II.

CELLULARII.

WHERE each Polypus is adherent in a corneous or calcareous cell with thin parietes, and only communicates with the others by an extremely tenuous external tunic, or by the minute pores which traverse the parietes of the cells.

These Polypi bear a general resemblance to the Hydræ.

CELLULARIA, *Linnæus*,

Where these cells are so arranged as to form branching stems in the manner of the Sertulariæ, but without a tube of communication in the axis. Their substance also is more calcareous.

Bodies exist in the ocean that resemble the corals (Polypiers) of which we have been speaking, both in substance and their general form, but in which Polypi have not yet been discovered. Their nature is consequently doubtful, and great naturalists, such as Pallas and others, have considered them as plants; others, however, consider them as having very small cells, and as being inhabited by coralliferous Polypi. In this case they belong to the present order. Those, in which the interior is filled with corneous threads, still present some analogy to the Ceratophyta. In the

Corallina, *Linnæus*,

We observe articulated stems placed on species of roots, and divided into branches, also articulated, on the surface of which no pores can be seen, and in which no Polypi have hitherto been discovered.

They are divided as follows.

Corallina proper,

Where the calcareous joints have a homogeneous appearance, and are without any apparent bark.

FAMILY III.

CORTICATI.

This family comprises genera in which all the Polypi are connected by a common, thick, fleshy, or gelatinous substance, in the cavities of which they are received, and which envelopes an axis varying in form and substance. The Polypi of those that have been observed are somewhat more complex than the preceding ones, and approximate more closely to the Actiniæ. Internally we observe a stomach from which eight intestines originate, two that are prolonged into the common mass, and two that are shorter, and seem to supply the place of ovaries.

They are subdivided into four tribes.

In the first, that of the

Ceratophyta,

The internal axis has the appearance of wood or horn, and is fixed. Two genera of them are known, and both extremely numerous.

Antipathes, *Linnæus*,

Commonly termed *Black Coral*, where the ramous and ligneous-like substance of the axis is enveloped with a bark so soft, that it becomes destroyed after death, when it resembles branches of dry wood.

GORGONIA, *Linnæus*,

Where, on the contrary, this horny or ligneous substance of the axis is enveloped by a bark, the thickness of which is so penetrated by calcareous granules that it dries on the axis, retaining its colours, which are frequently extremely vivid and beautiful; it is soluble in acids. The Polypi of several species have been observed; each one is furnished with eight denticulated arms, a stomach, &c., like those of Corallina and Alcyonium.

In the second tribe, that of the

LITHOPHYTA,

The internal axis is of a strong substance and fixed. In

ISIS, *Linnæus*,

This axis is ramous, and has no cells or cavities on its surface. The animal bark which envelopes it is mixed with calcareous granules, as in the Gorgoniæ. In the

MADREPORA, *Linnæus*,

The stony portion of Madrepores is either ramous, or forms rounded mosses, or leaves, but is always furnished with lamellæ which unite concentrically in points where they represent stars, or which terminate in lines more or less serpentine. While alive, this stony portion is covered with a living bark, soft, gelatinous, and completely covered with rosettes of tentacula, which are the Polypii or rather the Actiniæ, for they usually have several circles of tentacula, and the lamellæ of the stars correspond in some respects to the membranous laminæ of the body of the Actiniæ. The bark and Polypi contract on the slightest touch.

The diversity of their general form, and of the figures which result from the combination of their lamellæ, has given rise to various subdivisions, several of which however re-enter others. It will be impossible to establish them definitively until the relation of the Polypi with those forms are known.

When there is but a single star, circular or in an elongated line, with very numerous laminæ, we have the FUNGIA, Lam. The animal exactly represents a single Actinia, with large and numerous tentacula, and of which the mouth corresponds to the depressed part in which all the laminæ terminate.

Stony corals with a single star, that appear to have been perfectly free from adhesion, are found among fossils, and constitute the TURBINOLIA, Lam., CYCLOLITHUS, and TURBINOLOPSIS, Lamouroux.

When the Madrepore is ramous, and the stars are confined to the extremity of each branch, it becomes the CARYOPHYLLIA, Lam. The branches are striated. At each star is a mouth surrounded with numerous tentacula.

OCULINA, *Lamarck*.

The Oculinæ have very short lateral ramusculi, giving them the appearance of having stars along the branches as well as at the end. In

MADREPORA, *Lamarck*,

Or his Madrepores proper, the whole surface is roughened by little stars with projecting edges.

In his POCILLOPORA we observe little impressed stars with pores in the intervals.

In his SERIALOPORA, these little stars are disposed in linear ranges.

ASTREA, *Lamarck*.

A broad surface, usually convex and excavated by crowded stars, each containing a polypus furnished with numerous arms, but on a single range, in the centre of which is the mouth.

When it is a plane surface, or forms broad laminæ covered with stars on one side, it becomes an EXPLANARIA.

The PORITES are a sort of ramous Astreæ.

When this surface is marked with elongated lines, like little valleys separated by transversely furrowed hills, we have the MEANDRINA, Lam.

In each valley, and from space to space, we find mouths, and the tentacula, instead of forming rosettes round them, form a range along the sides of the valley. In some species they are totally wanting, the margin of each mouth being merely festooned.

If the hills which separate these valleys are raised in leaves or crests, sulcated on both sides, it is a PAVONIA. Mouths, usually without tentacula, are found at the bottom of the valleys.

When these hills are conical, or like projecting stars, we have the HYDNOPHORA of Fischer, and the MONTICULARIA of Lamarck. They should be distinguished according to the situation of their Polypi, which are at the summit of the projecting parts, as in Oculina, or at the bottom of the cavities, as in Meandrina.

AGARICINA.

The Agaricinæ are composed of laminæ hollowed on one side only by the valleys, which are themselves sulcated.

It is thought that we may approximate to the Madrepores in general, certain corals (Polypiers) or the SARCINULA, Lam., composed of cylinders, a section of which forms stars, by reason of the projecting laminæ which traverse the interior. When there is a solid axis in the middle of these laminæ we have STYLINA. These corals are perhaps as nearly related to the Tubiporæ.

MILEPORA, *Linnæus*,

Where the stony portion is extremely various in form, and the surface merely marked with little holes or pores, or even without any apparent orifices.

In the third tribe, or the

NATANTES,

The axis is stony but not fixed.

PENNATULA, *Linnæus*.

A common body, free from all adhesion, of a regular and constant form, and susceptible of locomotion by the contractions of its fleshy portion and the

combined action of its Polypi. This body is fleshy, and contracts or dilates in its various parts by means of the fibrous layers that enter into its composition; its axis encloses a simple stony stem; the Polypi have generally eight dentated arms.

Most of the species diffuse a vivid phosphorescent light.

Whatever be the general form of the Pennatulæ, one of their extremities is always destitute of Polypi, and has been compared to the tubular portion of a bird's feather.

PENNATULA, *Cuvier.*

The Pennatulæ, properly so called, have given their name to the whole genus, which name has been derived from their own resemblance to a quill. The portion destitute of Polypi is cylindrical, and terminates in an obtuse point. The other part is furnished on each side with wings or laminæ, more or less long and broad, supported by spines or rigid setæ which arise from their interior and roughen one of their edges, without, however, being articulated with the stony stem of the axis; it is from between their laminæ that the Polypi protrude.

In the fourth tribe the animal rind or bark encloses a mere fleshy substance without an axis either osseous or horny. In

ALCYONIUM, *Linnæus,*

As in the Pennatulæ, we observe Polypi with eight denticulated arms, and intestines prolonged into the common mass of the ovaries: but this mass is not supported by an osseous axis; it is always fixed to the body; and where it is drawn out into trunks and branches, nothing is found internally, but a gelatinous substance traversed by numerous canals surrounded with fibrous membranes. The bark is harder and excavated by cells into which the Polypi withdraw more or less entirely.

THETHYA, *Lamarck,*

Where we observe the interior roughened with long, siliceous, spiral lines, which unite on a similarly siliceous and central nucleus. The crust, as in Spongia, presents two sorts of holes; the first, closed by a sort of grating, must be for the intromission of water, and the second, which are gaping, for its exit.

After the Alcyonia are also placed the

SPONGIA, *Linnæus,*

Or Sponges; marine, fibrous bodies, whose only sensible portion appears to be a sort of tenuous gelatine which dries off, scarcely leaving a trace of it, and in which neither Polypi nor other moving parts have yet been discovered. Living sponges are said to exhibit a sort of tremulousness or contraction when they are touched; it is also affirmed that the pores, with their superficies, are perforated, and present a sort of palpitation; the existence of these motions, however, is doubted by Mr. Grant.

Sponges assume innumerable shapes, each according to its species, and resemble shrubs, horns, vases, tubes, globes, fans, &c.

Every one knows the

S. officinalis, or common sponge, which is found in large brown masses, formed of extremely fine, flexible, and elastic fibres, perforated with numerous pores and little irregular canals, all of which intercommunicate.

CLASS V.

INFUSORIA.

Naturalists usually close the catalogue of the animal kingdom with beings so extremely minute as to be invisible to the naked eye, and which have only been discovered since the invention of the microscope has unveiled to us, as it were, a new world. Most of them present a gelatinous body of the greatest simplicity, and for these, this is undoubtedly the situation; but authors have placed among the Infusoria, animals apparently much more complicated, and which only resemble them in their minuteness, and the dwelling in which they are usually found.

They will constitute our first order, though we must still insist upon the doubts relative to their organisation, which are not yet dissipated.

ORDER I.

ROTIFERA.

The Rotiferæ, as above stated, are distinguished by a greater degree of



complication. Their body is oval and gelatinous; we can distinguish in it a mouth, a stomach, an intestine, and an anus near the first. It most commonly terminates posteriorly in a tail that is variously constructed, and anteriorly it bears a singular organ, variously lobate, with denticulated edges, and of which the denticulations vibrate successively in such a manner as to give the organ itself the appearance of one or more dentated and revolving wheels. One or two prominences on the neck have even appeared to some observers to be furnished with eyes. This revolving organ does not serve to direct their aliment to the mouth; it may be supposed to have some connection with the function of respiration. In

Furcularia, *Lamarck*,

The body is unarmed; the tail is composed of articulations which enter one into the other, and is terminated by two threads.

It is on one of these—the *Furcularia* or *Rotifère des toits*—that Spallanzani performed his famous experiments. Covered with dust in the spouts on the roofs of houses it becomes desiccated, and after remaining in that state for several weeks re-acquires life and motion on being humected with a little water.

The Trichocercæ, Lam., appear to me to differ from the Furculariæ only in the diminished development of their vibratile organs. The

Vaginicola, *Lamarck*,

Seem to be Trichocercæ with a diaphanous envelope; but we may be allowed to fear there has been some optical illusion.

Tubicolaria, *Lamarck*,

The Tubicolariæ only differ from the Furculariæ, by secreting themselves in little tubes which they construct of foreign molecules, but which do not form any portion of their body, like those of the Coralliferi (polypiers). Their rotatory organ, however, shows itself out of the tube, nearly in the manner of the head of Polypi.

Brachionus, *Müller*.

The Brachioni, with rotatory organs and a tail nearly similar to those of the Furculariæ, have a sort of membranous or squamous shield, which covers their back like that of certain Monoculi.

ORDER II.

HOMOGENEA.

The body of the Homogenea presents neither viscera nor other complication, and is frequently destitute of even the appearance of a mouth.



The first tribe comprises those, which, with a gelatinous body more or less contractile in its different parts, still present external organs consisting of cilia more or less strong. When they have the form of a horn (cornet), from which the cilia issue as in the Polypi called *Vorticellæ*, we have the Ureolaria, Lam. When the body is flat, and these cilia are at one extremity, Trichoda. When they surround the whole body, Leucophra. When some of them are stout, and represent species of horns, Kerona. And when these pretended horns are

elongated into threads, HIMANTOPES. The second tribe consists of those which exhibit no external organ whatever, if we except a tail. In CERCARIA, Muller., the oval body is, in fact, terminated by a thread. To this genus belong (among others) those animalcules which are observed in the semen of various animals, and on which so many fanstastic theories have been founded.

When this thread is forked, as is sometimes the case, we have the FURCOCERCA of Lamarck.

VIBRIO, *Muller*,

Where the body is round and slender like a bit of thread.

It is to this genus that belong the

V. glutinis et aceti, or the pretended eels that are seen in vinegar and paste. Those that inhabit the former are frequently perceptible to the naked eye. It is asserted that they change their skin, consist of two sexes, produce living young ones in summer, and eggs in autumn. Freezing will not kill them. The others make their appearance in diluted paste.

The most singular genus of the whole is the PROTEUS, Lin. No determinate form can be assigned to them; their figure changes every instant, and is sometimes rounded, sometimes divided and subdivided into thongs, in the most odd and singular manner. MONAS, Mull.—The Monades, viewed under the microscope, resemble points moving with great rapidity, although destitute of any apparent organ of motion. VOLVOX.—A globular body, revolving on its axis, and frequently containing smaller globules, which are doubtless the continuation of the race.

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