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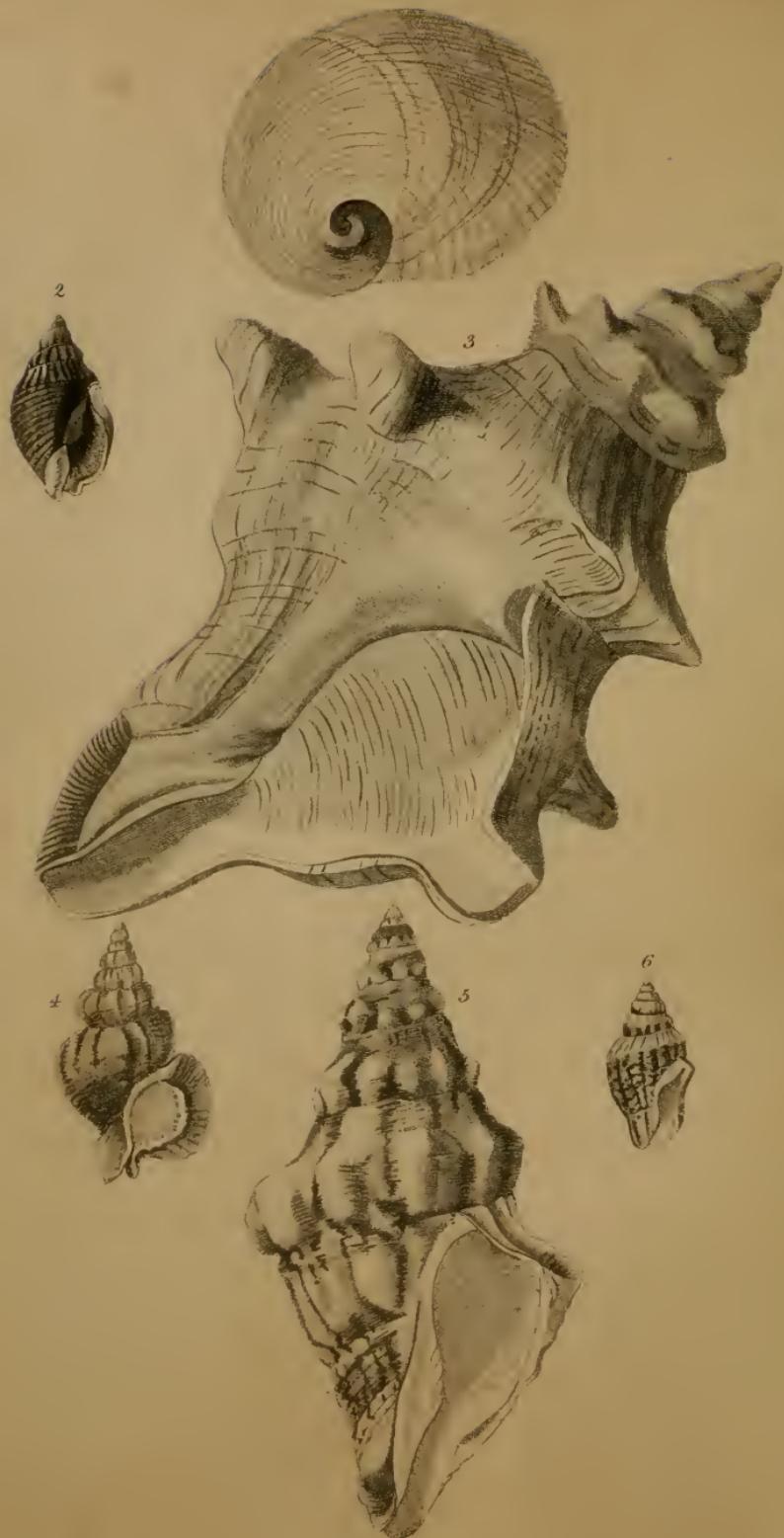
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1 *Cryptostoma savanica*. 4 *Triton valscidas*2 *Cylene Owenii*. 5 *Turbanella veritus*.3 *Fasciolaria lepadum* var. 6 *Columbella suturalis*.

THE
MOLLUSCA AND RADIATA.

ARRANGED BY THE

BARON CUVIER,

WITH

SUPPLEMENTARY ADDITIONS TO EACH ORDER.

BY

EDWARD GRIFFITH, F.L.S., A.S., &c.

AND

EDWARD PIDGEON, Esq.

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FOURTH AND LAST GRAND DIVISION
OF
A N I M A L S.

THE ZOOPHYTES, OR ANIMALIA RADIATA,

COMPREHEND a considerable number of beings whose organization, always manifestly more simple than that of the three preceding divisions, also exhibits more gradations, and seems to be constant only in this point, that the parts are disposed round an axis, and on two or several radii, or on two or several lines, proceeding from one pole to the other. The intestinal worms themselves, have at least two tendinous lines, or two nervous filaments, proceeding from a collar around their mouth. Several among them have four suckers round a prominence, in the form of a proboscis ; in a word, in spite of some irregularities, and with very few exceptions, (such as the planaria, and most of the infusoria) we always discover some traces of the radiating form, very much marked in the great majority of these animals, and especially in the asteriæ, the echini, the acalephæ, and the innumerable polypi.

The nervous system is never very evident ; when any traces of it have been at all discoverable, they were also disposed in radii ; but most frequently there is not the slightest appearance of it.

Nor is there ever any true system of circulation. The

holothuriæ have two vascular apparatus ; one attached to the intestines, and corresponding to the organs of respiration ; the other serving only to fill the organs which occupy the place of feet. This last alone is distinctly seen in the echini and asteriæ. We can see through the gelatinous substance of the medusæ, some canals, more or less complicated, which proceed from the intestinal cavity. All this indicates no possibility of a general circulation ; and in the great majority of zoophytes, it is easy to convince one's self that there are no vessels of any kind.

Some genera, such as the holothuriæ, the echini, and several intestinal worms, have a mouth, and an anus, with a distinct intestinal canal ; others have an intestinal sac, but with only a single opening, representing both mouth and anus. In the greater number, there is nothing but a cavity, hollowed in the substance itself of the body, which sometimes opens by several suckers. Finally, there are many in which no mouth is perceptible, and which can only be nourished by the absorption of their pores.

The distinction of sex is observable in several intestinal worms. The greater number of the other zoophytes are hermaphrodite and oviparous ; many have no genital organs, and are reproduced by buds, or by division.

The composite animals, of which we have already observed some traces among the last of the mollusca, are greatly multiplied in certain orders of the zoophytes, and their aggregations form trunks and expansions of every sort of figure. This circumstance, united to the simplicity of organization in the majority of species, and to that radiating disposition of the organs, which reminds us of the petals of plants, has obtained for them the name of *zoophytes* or *animal plants*, by which these apparent relations only are meant to be indicated ; for the zoophytes, possessing sensibility, voluntary motion, and nourished for the most part, on matters which they swallow,

or suck, and digest in an interior cavity, are assuredly animals in every sense of the word.

The greater or less degree of complication of the zoophytes has given occasion to their division into classes; but as we are not yet perfectly acquainted with all the parts of their organization, these classes cannot be characterized with as much precision as those of the preceding divisions.

The echini, and asteriæ, to which the spines that they are usually furnished with, have caused Bruguières to apply the name of ECHINODERMATA, have a distinct intestine, floating in a large cavity, and accompanied with several other organs for generation, for respiration, and for a partial circulation. It has been found necessary to unite to them the holothuriæ, which have an analogous internal organization, perhaps even still more complicated, although they have no moveable spines on the skin.

The INTESTINAL WORMS, which form the second class, have no very evident vessels in which a distinct circulation might be carried on, nor separate organs of respiration; their body is, in general, elongated or depressed, and their organs disposed longitudinally. The differences in their nutritive system will probably cause them one day to be divided into two classes, which we already indicate by establishing two orders. In fact, in some there is an alimentary canal suspended in a true abdominal cavity, which is wanting in the others.

The third class comprehends the ACALEPHÆ, or *sea-nettles*. They also have neither true circulating vessels, nor organs of respiration. Their form is generally circular, and radiating, and the mouth almost always serves as anus. They differ from the polypi only in a greater development in the tissue of their organs. The hydrostatic acalephæ, which we leave at the end of this class, may, probably, at some future time, constitute a separate one when they shall be better

known ; but it is only by conjecture that we can judge of the functions of their singular organs.

The POLYPI, which compose the fourth class, are all those little gelatinous animals, whose mouth, surrounded with tentacula, conducts into a stomach, sometimes simple, sometimes followed by intestines in the form of vessels. It is in this class that those innumerable composite animals are found, with a fixed and solid stem, which for a long time were regarded as marine plants.

It is customary to place subsequently to them the thethyæ, and sponges, although no polypi have yet been discovered in them.

Finally, the INFUSORIÆ, or fifth and last class of the zoophytes, are those little beings which have been discovered only by the microscope, and which swarm in stagnant waters. The majority of them present nothing but a gelatinous body, without viscera. Nevertheless, we have at their head some more complex species, possessing visible organs of motion, and a stomach. Of these, too, in all probability, at some future day, a separate class will be formed.

THIRD CLASS OF THE ZOOPHYTES.

THE ECHINODERMATA.

THE Echinodermata are as yet the most complicated animals of this division. Invested with a well organized skin, often supported by a sort of skeleton, and armed with points, or with articulated and mobile spines, they have an interior

cavity, in which distinct viscera are floating. A sort of vascular system, which, in truth, does not extend to the whole body, keeps up a communication with divers parts of the intestine, and with the organs of respiration, which, most generally, are also very distinct. We even observe in several species, some filaments which might perform the nervous functions, but which are never distributed with the regularity, and in the fixed order, which exists in the other two divisions of invertebrata.

We divide the echinodermata into two orders : those which have feet, or at least vesicular organs, to which this name has been given, and those which are destitute of them.

FIRST ORDER OF ECHINODERMATA.

THE PEDICELLATA

ARE distinguished by organs of motions altogether peculiar. Their envelope is pierced by a great number of small holes, placed in very regular series, through which pass some cylindrical, membranaceous tentacula, terminated each by a small disk, which performs the office of a copper. The part of these tentacula which remains in the interior of the body is vesicular. A fluid is spread through all their cavity, and is carried, at the will of the animal, into the external cylindrical part, which it extends, or it re-enters into the internal vesicular part, and then the external part sinks in. It is by elongating and contracting in this manner, their hundreds of little feet, or tentacula, and fixing them by the cuppers, which

terminate them, that these animals execute their progressive movements. Some vessels proceeding from these little feet, repair to the trunks, which correspond to their ranges, and which end at the mouth. They form a system distinct from that of the intestinal vessels which are observed in some species.

Linnaeus makes of these animals three genera, very natural, but sufficiently numerous, and comprehending species sufficiently varied to be considered as three families.

ASTERIAS, L. *Vulgò, Sea-stars, or Star-fish.*

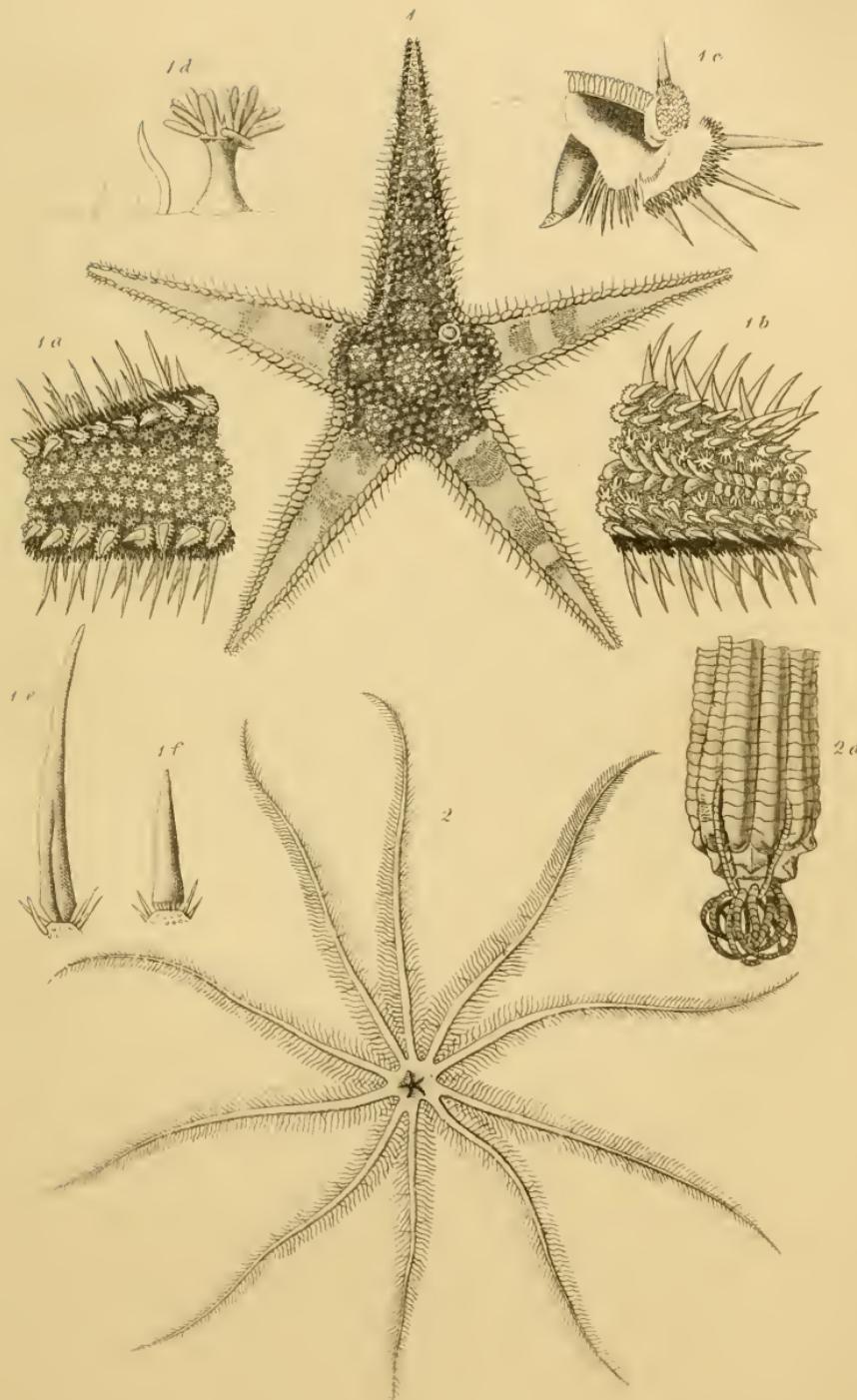
Have received this name, because their body is divided into radii, most frequently five in number, at the centre of which, underneath, is the mouth, which at the same time serves as anus.

The frame-work of their body is composed of small osseous pieces, variously combined, the arrangement of which would merit investigation. They have a very great power of reproduction, and not only reproduce the radii, which have been taken away separately, but a single ray with the centre being preserved can reproduce the others, which is the cause that we so frequently find them irregular.

In the

ASTERIAS, Lam.,

Or Asterias, properly so called, each ray has, underneath, a longitudinal furrow, on the sides of which are pierced all the little holes which allow the feet to pass. The rest of the inferior surface is provided with small mobile spines; the entire surface is also pierced with pores, which allow some tubes much smaller than the feet to pass, which probably serve to absorb the water, and to introduce it into the general cavity for a kind of respiration. On the middle of the body, a little towards the side, is a small stony plate, to which corresponds



1. J.J. 748. *Actinia*
comata (L.) *var.* *acuta* (L.)

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internally, a canal filled with calcareous matter, which is believed to contribute to the growth of the solid parts. Internally, is seen a large stomach immediately upon the mouth, from which proceed, for each ray, two cœca, ramified like trees, and each suspended to a sort of mesentery. There are also two ovaries in each ray, and it appears that the asteriæ fecundate themselves. A peculiar vascular system corresponds to their intestine, and there is another for the feet.

M. Tiedemann considers as their nervous system, a very fine filament which surrounds the mouth, and sends a branch to each arm, which proceeds externally between the feet, and gives forth two ramuscula internally.

Their osseous frame-work consists principally, for each branch, in a sort of column predominating along the inferior face, composed of vertebræ, articulated one with the other, and from which proceed the cartilaginous branches, which support the external envelope. Between the roots of these branches are the holes through which the feet pass. Other osseous pieces, to which mobile spines are frequently attached, furnish, in many species, the lateral edges of the branches.

Certain asteriæ have the form of a pentagon, with rectilinear sides, rather than that of a star. The radiation is marked externally only by the sulcus of the feet. (*Asterias discoïdea*, Lam.)

Others have, on each side of the pentagon, a slight re-entrant angle. (*Asterias membranacea*, Link.)

In others, the sides are concave, which begins to give them the figure of a star. (*Asterias tessalata*, Lam., &c.)

In these different species, the cœca and the ovaries are not as much elongated as in the majority of the others, which have their radii elongated, and separated by well marked re-entrant angles.

Such are

Ast. rubens, L. Encyc. cxiii. 1, 2. which is exceedingly

common on all our coasts, so much so, that in some places it is employed to manure the grounds.

Ast. glacialis, L. Link. xxxviii. 69. Encyc. cvii. and cviii. is frequently more than a foot in diameter; the spines which invest the upper part of its body are surrounded with a multitude of little fleshy tubes, which form sorts of cushions around their bases.

Ast. aurantiaca, L. Link. vi. vii. xxiii. Encyc. cx. Echin. pl. iv. 1., is our largest species. The edges of its branches are furnished with pieces, like mosaic work, on which some strong mobile spines are articulated. All the upper part is covered with some other small spines, terminating in truncated and bristling heads.

Some have a number of rays above five. Their cœca and ovaries are very short. (*Ast. paposa*, Link.)

We must separate from the other asteriæ, the species in which the rays have no longitudinal furrows underneath, for the purpose of lodging the feet; in general, these rays are not hollow, and the stomach is not prolonged into cœca, but its prominences remain in their intervals. Locomotion is effected principally by the curving and the movement of the radii, and not by the feet, which are too few in number.

M. de Lamarck names *Ophiures* those which have round a central disk five radii not branched. But we should still distinguish

Those in which these radii are furnished on each side, with mobile spines. The small fleshy feet also issue forth on each side from between the basis of these spines. (*Ast. nigra*, Müll., &c.)

And those in which the radii, having no lateral spines, but being furnished with imbricated scales, resemble the tails of serpents. The central disk, has, in each interval of the rays, on the side where the mouth is, four holes which penetrate into the interior, and serve, perhaps, for respiration, or, ac-

cording to others for the issue of the eggs. There are no feet, except in five short furrows, which form a star around the mouth. (*Ast. ophiura*, Lin., &c.)

The GORGONOCEPHALA, *Leach*, named *Euryale*, by M. de Lamarck, are those in which the radii are divided into a double point. There are some in which this division commences from the base of the radii, and which present the appearance of a parcel of serpents. They have been vulgarly named *heads of Medusa*. The base of each ray has two penetrating holes. (*Asterias caput Medusæ*, &c.)

But there are also some in which the division commences only at the end of the ray, and is but little repeated. (*Euryale palmiferum*, Lam.)

We should still separate from the other asteriæ

The ALECTO of *Leach*, which M. de Lamarck calls *Comatula*. They have five large articulated radii, divided each into two or three, which support two ranges of articulated filaments. These five radii are attached to a stony disk which again supports, on the side opposite to the mouth, one, two, or three ranges of other articulated filaments without branches, shorter and thinner than the large radii, and which, it is said, enable them to hook themselves to bodies. The sac which contains the viscera is at the centre of the large radii, opened by a star-formed mouth, and another tubular orifice, which may be the anus. (*Asterias multiradiata*, &c.)

It is near the comatulæ that we should place

ENCRINUS, *Guett.*,

Which may be defined to be comatulæ, with a disk prolonged into a stem divided into a great number of articulations. Their branches themselves are articulated, and divided into pairs of branches, supporting a range of filaments, all articulated, and the stem itself supports some smaller ones, at

various heights. In the centre of the radii is the mouth, and the anus on one side.

There is in the seas of Europe but one very small species, *Pentacrinus Europaeus*, Thomson, Monogr., which is attached to divers lithophytes.

The seas of the warmer climates produce larger and more complex species, such as *Encr. asterias*, Blum., *Isis aster.*, Linn.

But the fossil encrini are very numerous, and vary sufficiently in detail to be divided into several subgenera, according to the composition of the central body, placed at the summit of the stem, and from which the large radii proceed.

This body may be formed of pieces articulated with the stem, and supporting radii by similar articulations. Then if the stem is round and enlarged at the top, these are the **APIOCRINITES**, Mill.

If it is round, but not enlarged, the **ENCRINITES**.

If it is pentagonal, the **PENTACRINITES**.

Or this body may be formed of angular laminæ, joined together by their edges, and forming several ranges.

Among those

The **PLATYCRINITES** have but two ranges, one of three laminæ, the others of five.

The **POTERIOCRINITES** have three ranges, each of five plates.

The **CYATHOCRINITES** have also three, each of five, but the last has some intercalary laminæ, which may increase it even up to ten.

The **ACTINOCRINITES** have several ranges, the first of three, the second of five, the others more numerous. The first two have radiated crests.

The **RHODOCRINITES** have also several ranges, the first

of three, the second of five, the third of ten, all three with crests; then follow some with more numerous laminæ.

Finally, the central body may be all of one piece, but which appears to be composed of five cemented together. These are the **EUGENIACRINITES**.

The fossil productions, known under the name of Entrochi, are pieces of the stem and of the branches of animals of this genus.

ECHINUS, Lin. Vulgò *Sea urchins.*

Have the body clothed with a testa, or calcareous crust, composed of angular pieces, which join exactly, and are pierced with several very regular ranges of innumerable small holes, through which pass the membranous feet. The surface of this crust is armed with spines articulated on little tubercles, and moveable at the will of the animal, to whose motions they administer, conjointly with the feet, which are situated between them. Other membranous tubes, much finer, and often divided at their extremity, probably serve to introduce and to expel the water which fills the interior of their shell. The mouth is furnished with five teeth, engraved in a very complicated calcareous frame-work, resembling a lantern with five panes, furnished with divers muscles, and suspended in a large aperture of the testa. These teeth, in the form of long bands, grow hard towards their root, in proportion as they are worn at the point. The intestine is very long, and attached spirally to the interior parietes of the testa by a mesentery. A double vascular system runs along this canal, and extends partly over the mesentery, and there are also particular vessels for the feet. Five ovaries situated around the anus empty themselves each by a particular orifice. They form the eatable part of these animals.

The echini subsist more especially on small testacea, which they seize with their feet. Their motions are very slow.

Their testæ are preserved in great abundance in ancient strata, especially those of the chalk formation, when they are usually filled with silex.

The echini should be divided into regular and irregular.

The regular

ECHINI, (properly so called) *Lam.* *CIDARIS, Klein.*

Have the testa generally spheroidal, the mouth at the middle of their inferior face, and the anus precisely opposite. The little holes are ranged there on six bands approximated by pairs, which proceed regularly from the mouth to the anus, like the meridians of a globe.

Certain species have large and thick prickles of very various forms, supported on thick tubercles of the testa, and the bases of which are surrounded with other smaller prickles. (*Echinus mamillatus*, L., &c.)

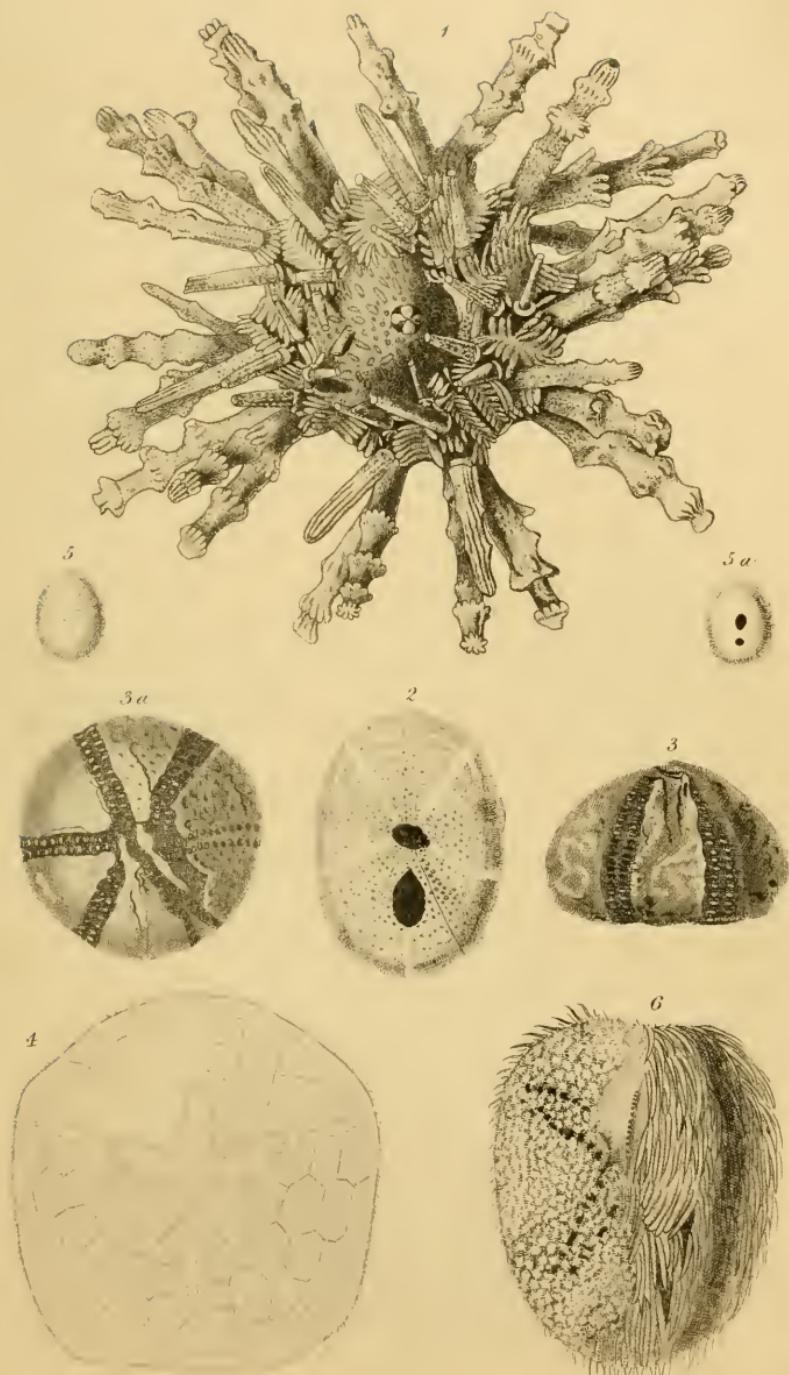
It is among these species that are ranged, as M. de Luc has discovered, those whose prickles, in the form of olives, are frequently found petrified in chalk or other ancient formations, and have received the name of *Judaic stones*.

The most common species, and especially those of our coasts, have only slender spines, articulated on small tubercles, much more numerous. Such is

**ECHINUS ESCULENTUS, L., Klein., Lesk., I. A. B.,
Encyc. 132.**

Of the form and size of an apple, all covered with short, striped tubercles, usually of a violet colour. Its ovaries are eaten in spring uncooked, they are reddish, and of a flavour sufficiently agreeable.

The neighbouring species are difficult enough to distinguish, being marked by the greater or less approximation of the bands of holes, by the equality or inequality of the tubercles, &c. (*Ech. miliaris*, Kl., &c. &c. &c.)



1 *Fenestraria articulata*

2 *Eidolon curvirostre*

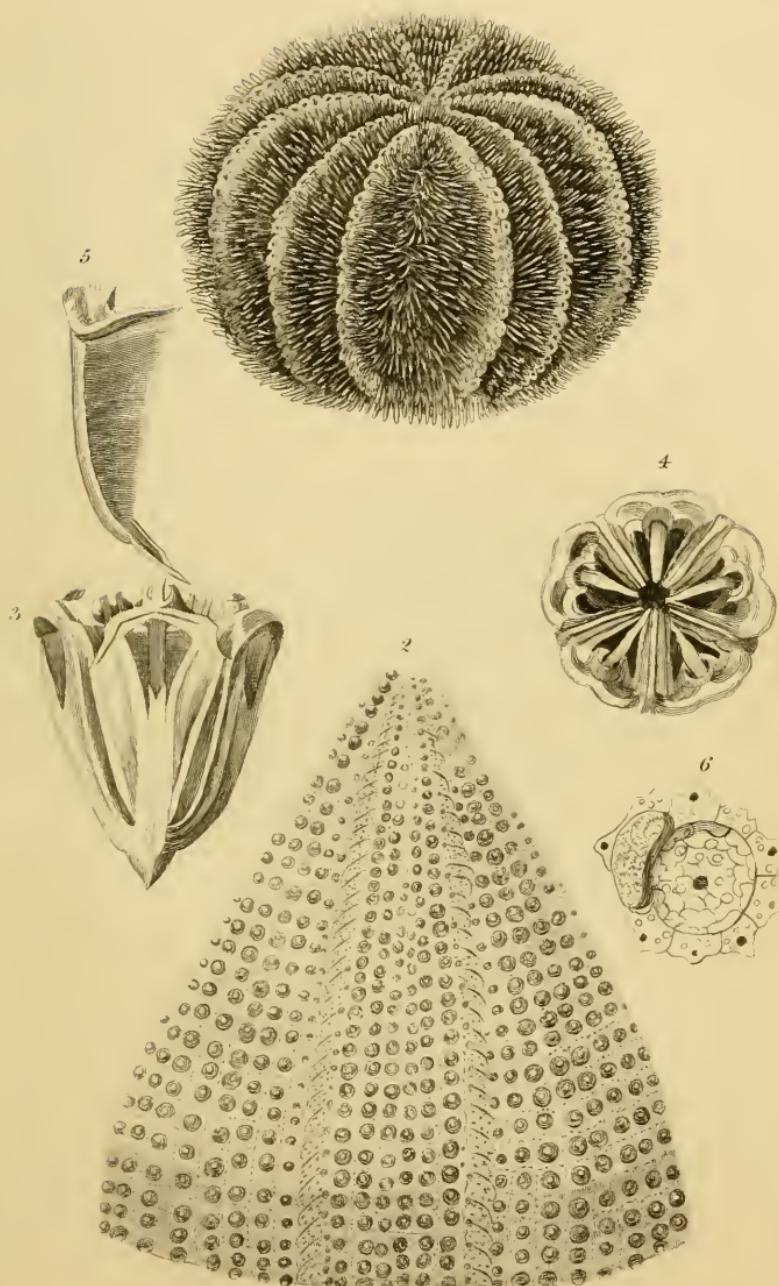
3 *Sentella herapera*

4 *Leptostomia reticulata*

5 *Etidularia ovalis*

6 *Spatangus pilosus*

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1 *Echinus esculentus.* 4 Top of 'same'.

2 Part of the Head 5 A single Tooth

3 Dentary apparatus. 6 Ovities of the ovary

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Some round and depressed echini lose something of their regularity by a wide sulcus, with which they are furrowed on one side. (*Ech. sinuatus*, Kl.)

There are also some of these echini with mouth and anus opposite, which, instead of having the spheroidal form on a circular plane, are transversely oval, that is to say, one of their horizontal diameters is larger than the others. (*Ech. lucunter*, Kl.)

They also differ among themselves by the equality or inequality of the prickles, and by the relative proportions of the tubercles.

One species should be distinguished,—*Echinus atratus*, L. Encyc. 140. 1—4, in which the prickles, widened, truncated, and angular at their extremity, touch each other there, like pavement. Those of the margin are long and flattened.

We call irregular, all the echini in which the anus is not opposite to the mouth. It appears that they are furnished only with short and slender prickles, almost like hairs. Among them some still have the mouth at the middle of the base. They may be subdivided, according to the extent of the bands of holes for the feet. Sometimes these go, as in the preceding, from the mouth to a point directly opposite, or they unite after having embraced the entire testa. In the former, the

ECHINONE, *Phelsum* and *Leske*,

Have the round or oval form of certain regular echini, the mouth at the middle of the base, and the anus between the mouth and the margin, or near the margin, but underneath; oval species, *Echinus cyclostomus*, Müll., &c.; round species, *Ech. depressus*, Walch, &c.

NUCLEOLITES, *Lin.*,

Have, with these characters, the anus near the margin, but above.

The known species are all fossil. (*Spatangus depressus*, Leske.)

Others,

GALERITES, Lam. CONULUS, Kl.

Have a flat base, on which their body is raised like a cone, or a semi-ellipsoid figure. The mouth is at the middle of the base, and the anus near its margin.

They are very common in rocky strata, but no living species are known.

The most extended is *Ech. vulgaris*, L. Encyc. 153. 6—7. Klem. Ed. Fr. VII. D. G.

Some have not their bands of holes distributed in the quinary number. *Ech. quadrifasciatus*, Walch, &c.

SCUTELLA, Lam.,

Have the anus between the mouth and the margin, the testa exceedingly depressed, flat underneath, and of a form approaching to orbicular.

Some have it entire, and without any other holes than the series of little pores which are seen in all the echini.

Others have the testa equally, without large holes, but divided by two emarginations. (*Echinus auritus*, Seb., &c.)

Others have it entire, and pierced from interval to interval, by some large holes which do not penetrate into its cavity. (*Echinus hexaporus*, Seb., &c.)

Others have it at once emarginated, and pierced with three large holes. (*Echinus tetraporus*, Seb.)

There are some, in fine, *ROTULÆ, Kl.*, in which a part of the posterior margin is festooned, like a dentated wheel, and these are divided according as they have large holes. (*Ech. decadactylus*, Encyc. ;) or according as they want them, (*Echinus orbiculus*, Encyc.)

CASSIDULUS, Lam.,

Are oval, and have the anus above the margin, like the

nucleolites, but they are distinguished by their incomplete bands of pores, that is to say, not proceeding from one pole to the other, and figuring a star. (*Cassidulus Caribaeorum*, Lam.)

Other irregular echini have not the mouth at the centre of their base, but it is towards one side, often transversely, and directed obliquely. The anus is towards the other side. They are subdivided according to the extent of their ranges of holes.

Thus the ANANCHITES, Lam., GALEÆ, Kl., have a little the form of the Galerites, and their complete bands, their greatest difference, consists in the position of the mouth. They are only known in the fossil state. Such is

ECHINUS OVATUS, L., Cuv. et Brong.

(*Envir. de Paris*, 2d. edit. f. v. 7. A. B. C. D.)

A species extended in innumerable quantities in the chalk formations of our environs.

Some have four bands. (*Ech. quadriradiatus*, Kl.)

We may make a particular subgenus of certain species, in which the four lateral bands are disposed by pairs, and do not rejoin at the same point. (*Ech. bicordatus*, Kl.)

At other times these irregular echini, with central mouth, have bands of pores which do not lead to the mouth, but which form on their back a sort of rose. Such are

CLYPEASTER, Lam. ECHINANTHUS, Klein.,

Which have the anus near the margin, and whose body is depressed, with oval base concave underneath. They have sometimes the contour a little angular. (*Ech. rosaceus*, and its varieties, Kl.)

Sometimes their back is elevated in the middle. (*Echinus altus*.)

There are some also whose contour is not angular. (*Ech. oviformis*, Seb.)

And even where it is almost orbicular. (LAGANUM, Klein. *Echinus orbiculatus*.)

FIBULARIA, Lam. ECHINOCYAMUS, Leske.,

Have, with the rose of the clypeaster, the body almost globular, and the mouth and anus approximated in the middle of the under part. They are usually very small. (*Echinus nucleus*, Kl., &c.)

On the contrary, SPATANGUS, Kl., have, with the lateral mouth of the ananchites, some incomplete bands of pores, forming a rose on the back. There are usually but four; that which is directed from the side of the mouth is obliterated.

Some, BRESSOIDES, Kl., have the testa oval, without furrows. (*Ech. teres*, Seb.)

Others have a large sulcus more or less marked, in the direction of the obliterated band. (*Ech. spatangus*, Seb., &c.)

When, besides this, they preserve the oval form, they are BRISSUS, Kl., but sometimes this sulcus grows deep, and the testa widening at the same time on this side, assumes the figure of a heart. (*Ech. purpureus*, Müll., &c.)

We have some in our seas of the last two forms. Branched tentacula, like those of the holothuriæ, have been observed round the mouth.

HOLOTHURIA, Lin.,

Have the body oblong, coriaceous, and open at the two ends. At the anterior extremity is the mouth, surrounded by very complicated branched tentacula, which can be completely retracted. At the opposite extremity opens a cloaca, where terminate the rectum and the organ of respiration, in the form of a hollow tree, very much ramified, which is filled with

water, or emptied at the will of the animal. The mouth has no teeth, and is furnished only with a circle of osseous pieces. Some appendages, in the form of pouches, pour a saliva into it. The intestine is very long, diversely plicated, and attached to the sides of the body by a mesentery. A sort of partial circulation takes place in a very complicated double system of vessels, exclusively relative to the intestinal canal, and in a part of the meshes of which, is interlaced one of the two respiratory trees of which we have just spoken. There also appears to be a nervous cord, but very much attenuated, around the œsophagus. The ovary is composed of a multitude of blind vessels, partly branched, which all terminate at the mouth by a small common oviduct. They assume, at the time of gestation, a prodigious extension, and are then filled with a red matter, which appears to be the eggs. Some cords, of an extreme sensibility, attached near the anus, and which are developed at the same time, appear to be the male organs. These animals must, then, be hermaphrodites. When they are disturbed, they frequently contract themselves with so much force that they tear and vomit up their intestines¹.

The holothuriæ may be divided according to the distribution of their feet.

In some, they are all situated in the middle of the under part of the body, which forms a softer disk, on which the animal crawls, elevating the two extremities where the mouth and anus are placed, which they contract more than the middle. The anus finishes almost in a point. Their tentacula are very large when developed.

We have one in our seas whose envelope is almost scaly, *Hol. phantapus*, L. Müll., Zool., Dan. cxii. cxiii. Mem.

¹ For the anatomy of Holothuriæ, consult M. Tiedemann's excellent work already referred to.

de Stok., 1767. The feet of its central disk are on three series.

Others have the inferior face altogether flat and soft, furnished with an infinity of feet, and the superior face gibbous, supported frequently by osseous scales, and pierced on the front, with a star-like orifice, which is the mouth, and from which the tentacula issue; and on the back part with a round hole, which is the anus.

We have a small one, *Hol. squamata*, Müll., Zool., Dan. x. 1, 2, 3; but there are some of these of a tolerable size in the warmer seas.

Others have the body cartilaginous, flattened horizontally; trenchant at the edges; the mouth and feet at the inferior face, and the anus at the posterior extremity.

Such is in the Mediterranean,

Pudendum regale, Fab., Column, Aquat. xxvi. 1. *Hol. regalis*, Nob., a species more than a foot in length, three or four inches broad, and crenulated all round.

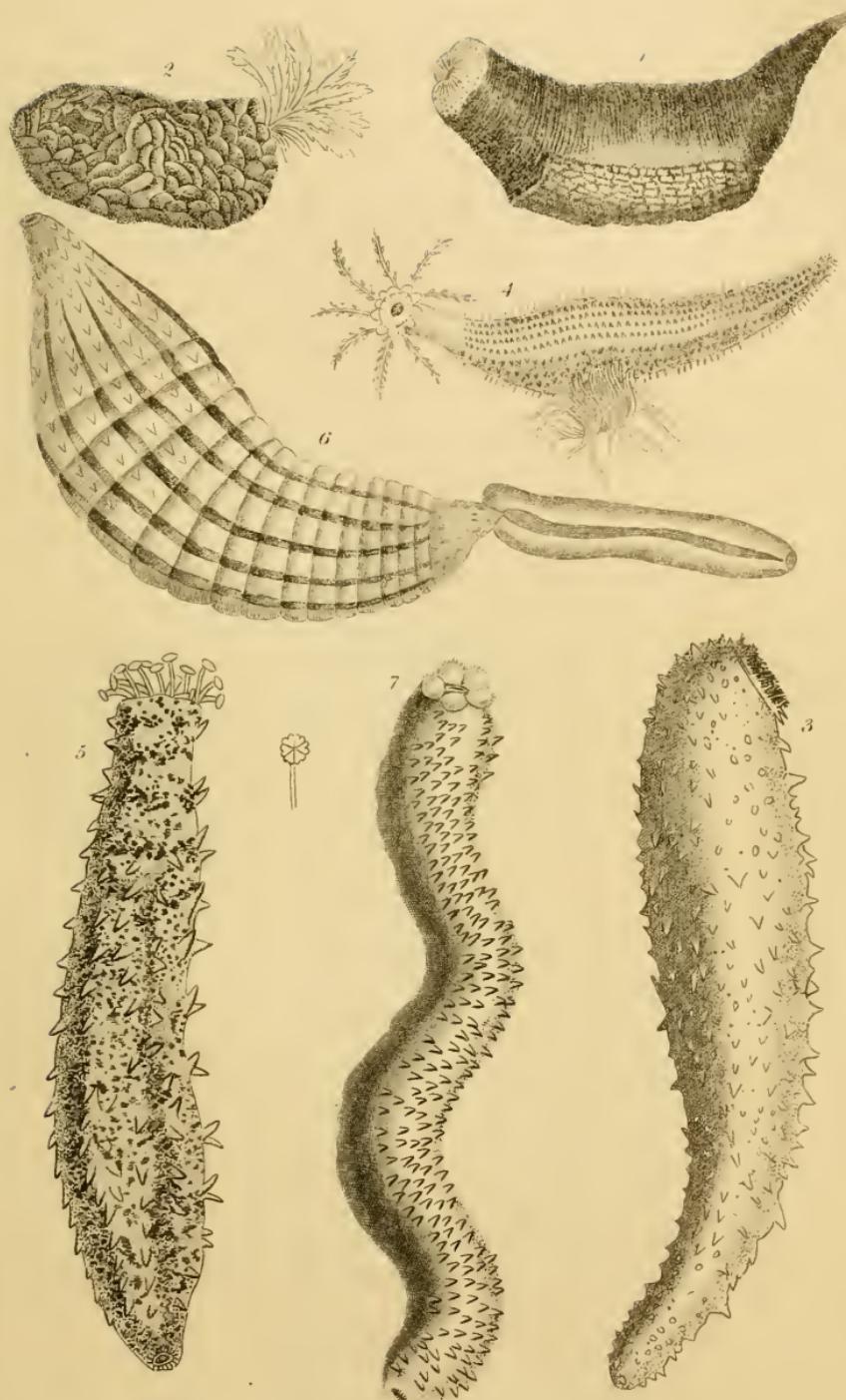
Others, again, have the body cylindrical, susceptible of enlargement in every direction by the absorption of water; all the under part furnished with feet, and the rest of the surface variously bristled.

Our seas, especially the Mediterranean, produce in great abundance one of blackish colour, which is more than a foot long in its greatest extension. Its back is bristled with conical and soft points; its mouth is furnished with twenty branched tentacula; it is the *Holothuria tremula*, Gm., Bohatch., Anim. mar. vi. and vii.

Some are found in which the feet are distributed in five series, which extend like the ribs of a melon, from the mouth to the anus, which has caused them to be called sea-cucumbers.

Such is in our seas.

Hol. frondosa, L. Gunner, Mem. de Stok. 1767. pl. iv. f. 1,

1 *Holothuria phantopus.* 4 *Hol. fuscus.*2 *Hol. squamata.* 5 *Hol. cucumer.*3 *Hol. elegans.* 6 *Hol. caecum.*7 *Hol. edulis.*

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2. and cxxiv. The body is brown, and a foot or more in length.

Finally, there are some whose body is equally furnished with feet all round. (*Hol. papillosa*, &c.)

THE SECOND ORDER OF ECHINODERMATA,

OR

ECHINODERMATA APEDICELLATA,

COMPREHEND but a small number of animals, which present great relations with the holothuriæ, but which want the small vesicular feet of the preceding order. Their body is clothed with a coriaceous skin, and without armature. Their internal organization is not yet cleared up on all points.

MOLPADIA, *Cuv.*,

Have, like the holothuriæ, a coriaceous body, in the form of a thick cylinder, open at the two ends, and their internal organization is pretty similar to that of those animals; but, besides that they want feet; their mouth has no tentacula, and is furnished with an apparatus of osseous pieces, less complicated, however, than that of the echini.

I know but a single species belonging to the Atlantic Ocean, the extremity of whose anus is finished in a point. (*Molpadia holothurioïdes*, *Cuv.*)

MINYAS, *Cuv.*,

Have also the body without feet, and open at the two ends; but its form is that of a spheroid depressed at the poles, and furrowed like a melon. I can find no armature to the mouth.

There is a very fine species of a deep blue, in the Atlantic ocean. (*Mynias cyanea*, Cuv., Règ., An. iv. pl. xv. f. 8.)

PRIAPULUS, Lam.,

Have a cylindrical body, marked transversely with deep annular wrinkles, terminated in front by an elliptical mass, slightly wrinkled longitudinally; pierced with the mouth, and behind with the anus, from which issues a thick bundle of filaments, which may be the organs of generation. The interior of the mouth is furnished with a great number of very sharp corneous teeth, placed like a quincunx, and directed backwards; the intestine goes straight from the mouth to the anus; the muscular system resembles that of the holothuriæ.

We are acquainted with but a single species from the north seas, *Holothuria priapus*, L. Müll., Zool., Dan. xcvi. 1. two or three inches in length.

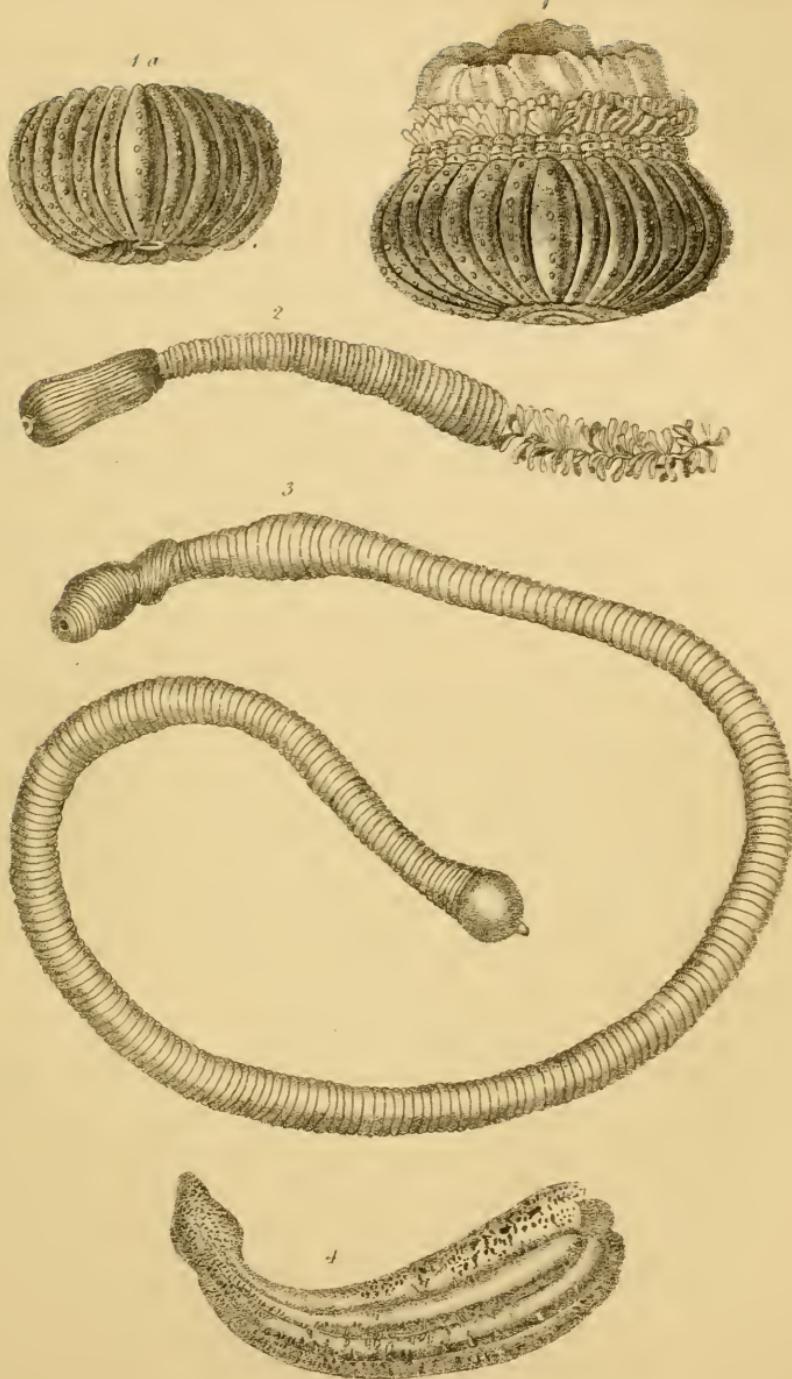
LITHODERMIS, Cuv.,

Have the body oval, compressed behind, and the surface is as it were incrusted with a stratum of small stony grains, which form a very hard crust. The mouth is surrounded with tentacula, and the intestines appear to have resemblances to those of the holothuriæ. I do not find any anus.

We know but a single species from the Indies, *Lithod. cuneus*, Cuv., blackish, two inches in length.

SIPONCULUS, Gm.,

Have a cylindrical elongated body, with a thick skin, wrinkled in both directions; the mouth at an extremity in the form of a proboscis, which may be retracted or put forth, by means of large interior muscles, and the anus more or less near the base of this proboscis. The intestine originates from the mouth, proceeds as far as the opposite extremity, and returns, convoluting spirally round its first part. We find

1. *Menya s. cyanea.*2. *Priapula caudata* (*P. priapus Moll.*)3. *Sipunculus edulis.*4. *Sip. torriani.*

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nothing in it but sand and fragments of shells. Numerous vessels appear to unite it to the external envelope, and there is, moreover, along one of their sides, a filament which may be nervous. Two long pouches situated in front, have their external orifices a little under the anus, and internally, near this last orifice, is sometimes seen a packet of branched vessels, which may appertain to the respiratory function.

These animals remain in sand under the sea water, like the arenicolæ, thalassema, &c., and they are sought after like those, for the purpose of being used as bait.

There are several species of them as yet but badly distinguished.

One of them, *Sip. edulis*, Nob., *Lumbricus edulis*, Gm., Pall., Spic., Zool. x 1. 7. serves as food for the Chinese who inhabit Java, and who go to seek for it in the sand, with little bamboo sticks prepared for the purpose.

Others, sufficiently small, *Sip. levis*, *Sip. verrucosus* Cuv., pierce the submarine stones, and lodge in their cavities.

BONELLIA, Rolando,

Have the body oval, a proboscis formed of a plicated lamina, susceptible of an extreme elongation, and forked at its extremity. The anus is at the opposite extremity of the body; the intestine is very long, replicated several times, and near the anus are two ramified organs, which may serve for respiration; the eggs are contained in an oblong sac, which has its issue near the base of the proboscis.

These animals live deeply in the sand, and protrude their proboscis as far as the water, and even sometimes into the air itself, when the water is low.

We have one species in the Mediterranean, *Bonellia viridis*, Rol. Ac. de Tur. t. xxvi. pl. xiv.

THALASSEMA, Cuv.,

Have the body oval, or oblong, and the proboscis in the form of a plicated lamina, or small spoon, but not forked. But one abdominal filament is discoverable.

We distinguish

THALASSEMA, (properly so called,)

Which have only two hooks placed very much in front, and the posterior extremity has no setæ. (*Thalassema neptuni*, Gertner, &c.)

ECHIURUS,

Whose posterior extremity is furnished with some transverse ranges of setæ.

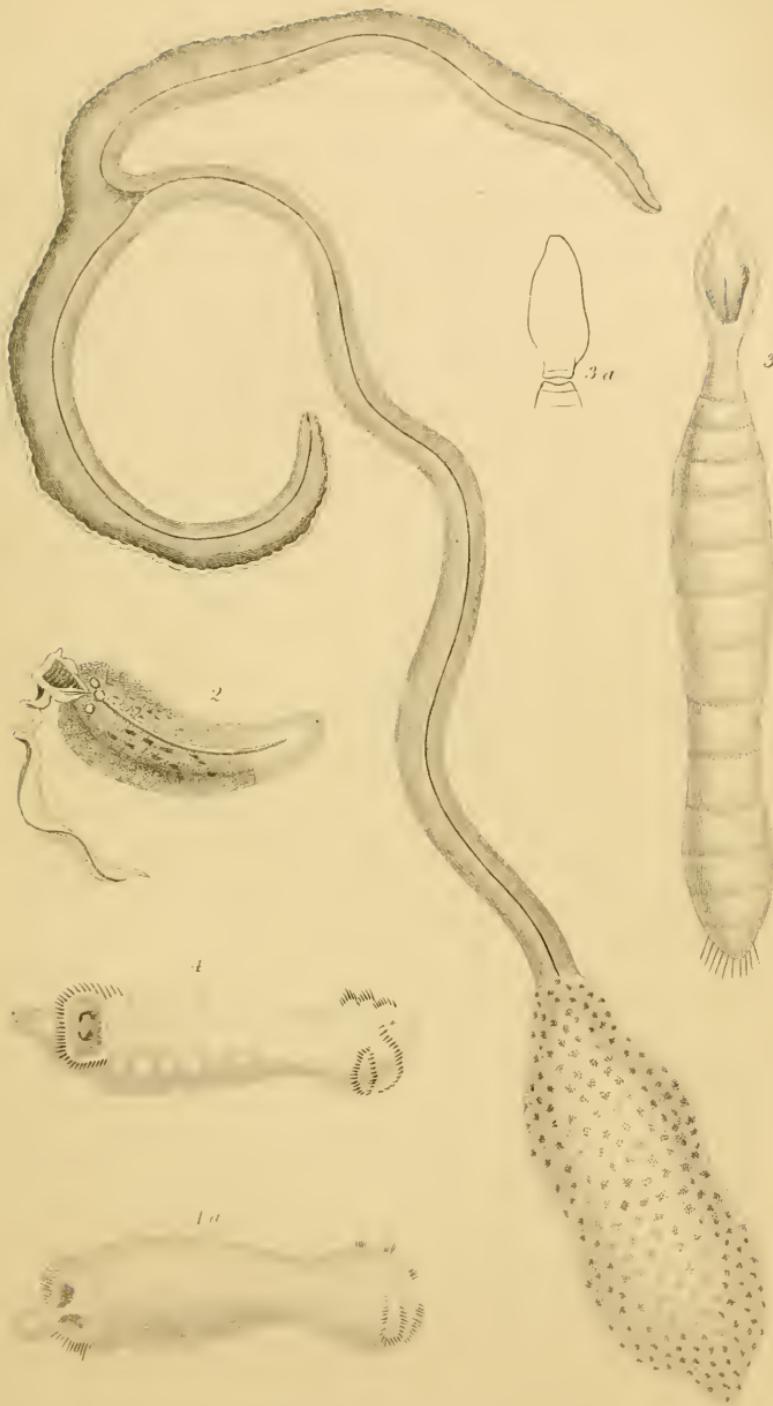
One is known, *lumbricus echius*, Gm., Pall., miscell. Zool. xi. 1—6, which inhabits our coasts, on the sandy bottoms. It serves as bait to fishermen.

STERNASPIS, Otto,

Which, beside the setæ of echius, have under the anterior part, a disk, a little corneous, surrounded with ciliæ. (*Thalassema scutatum*, Ranz., &c.)

SECOND CLASS OF ZOOPHYTES.**INTESTINA, ENTOZOA, Rudolphi,**

Have, for the most part, this peculiarity, that they are unable to live, or to propagate, except in the interior of the body of other animals. There is almost no animal that does not nourish several kinds of them, and those which are observed

1. *Benettia viridis.*2. *Thalassema mepluni* L. *thalassina* Pal.3. *Echiurus Pallasii* var. *L. echiurus* Gm.4. *Sternaspis thalassimoides* v. v.

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in one species but rarely extend to many other species. They are not only found in the alimentary canal, and the canals which conduct thither, such as the hepatic vessels, but even in the cellular tissue, and in the parenchyma of the best enveloped viscera, such as the liver and the brain.

The difficulty of conceiving how they get into such places, joined to the observation that they never appear out of living bodies, has caused some naturalists to imagine that they engender spontaneously. It is now, however, quite certain, not only that the majority manifestly produce eggs, or living young ones, but that many of them have separate sexes, and couple like ordinary animals. We may then believe that they propagate by germs, sufficiently small to be transmitted through the narrowest passages, or that frequently the animals in which they live bring the germs into the world with them.

We discover in the intestinal worms, neither tracheæ nor gills, nor any other organ of respiration, and they must receive the influence of oxygen through the medium of the animals which they inhabit. They present no trace of a true circulation, and only vestiges of nerves, so obscure, that several naturalists have doubted their existence.

When these characters are found united in an animal, with a form similar to that of this class, we range it here, although it does not inhabit the interior of another species.

Every one knows to what an extent the intestinal worms injure the animals in which they are too much multiplied. Against those of the alimentary canal many remedies are employed, of which the most efficacious appears to be animal oil, &c., mixed with oil of turpentine.

We divide them into two orders, perhaps sufficiently different in organization to form two classes, if adequate observation could affix their limits.

INTESTINA CAVITARIA. (ENTOZOA NEMATOIDEA, *Rud.*,)

Which have an intestinal canal floating in a distinct abdominal cavity, and a mouth and anus.

INTESTINA PARENCHYMATA,

Whose body encloses, in its parenchyma, some viscera, but imperfectly terminated, and most frequently resembling vascular ramifications, even sometimes being not at all perceptible.

THE FIRST ORDER OF INTESTINA.**CAVITARIA. NEMATOIDEA, *Rudolphi*,**

COMPREHEND those whose external skin, more or less furnished with muscular fibres, and in general striated transversely, contains an abdominal cavity, in which floats a distinct intestinal canal, proceeding from the mouth to the anus, and where also are generally observed some distinct organs for the two sexes. The intestine is united to the neighbouring parts, and to the general envelope by numerous filaments, in which some have imagined that they discovered nutritive vessels, others tracheæ, but without any proof. It is impossible to observe in these animals any true circulation, but there appears to be in many, one or two nervous cords, proceeding from a ring which surrounds the mouth, and running the entire length of the body, on the internal face of the envelope.

The intestine is generally straight, and tolerably broad; the oesophagus is frequently more slender, and in some species we remark a stomach more ample and more robust. The

internal organs of generation consist in very long vessels, containing the semen, or the eggs, and having their issue at different points according to the genera.

FILARIA, L.,

Have the body elongated and slender, in the form of a thread, pierced in front with a round mouth. Externally they very much resemble the gordius. They are principally found in the cavities of animals, which have no external issue in the cellular substance, and even in the thickness of the muscles, and the parenchyma of the viscera. They are sometimes in parcels, and in innumerable quantities, enveloped in sorts of capsules. They are even found in insects, and in their larvæ, and in the visceral cavity of several of the mollusca.

The most celebrated species of this genus is,

Filaria Medinensis, Gm. Encyc. xxix. 3. (Vulg. *Guinea-Worm*.) Very common in warm climates, where it insinuates itself under the human skin, principally in the legs, and is sometimes developed there, to the length of ten feet and more, if we may credit the accounts of some writers. It can subsist there for several years, without causing any very lively sensations; but it also sometimes produces very dreadful pains and convulsions, according to the parts which it attacks. When it shows itself externally, it is seized, and drawn out very slowly, for fear of breaking it. It is as thick as the quill of a pigeon's feather. Its distinctive character is to have the end of the tail pointed and hooked.

TRICHOCEPHALUS,

Have the body round, thicker behind, and as slender as a thread in front. This slender part is terminated by a round mouth.

The most known is,

Trich. dispar. Rud. Gœtz. vi. 1—5. Encyc. xxxiii. 1—4.

One or two inches in length, of which the thick part occupies only one third. In the male this part is convoluted spirally, and a small penis is visible, which comes out near the tail. In the female it is straighter, and simply pierced at the extremity.

It is one of the most common worms in the large intestines of man, and multiplies beyond measure in certain disorders.

From the trichocephali have been distinguished,

TRICHOSTOMUS, Rus. CAPILLARIA, Zeder.,

The anterior part of which grows slender only by degrees ; and the

OXYURIS, Rud.,

In which it is the posterior part of the body which is attenuated in the form of a thread.

A species is known belonging to the cœcum of the horse, *Oxyuris curvula*, Rud. Goetz. vi. 8. Encyc. xxxiii. 5., from one to three inches in length.

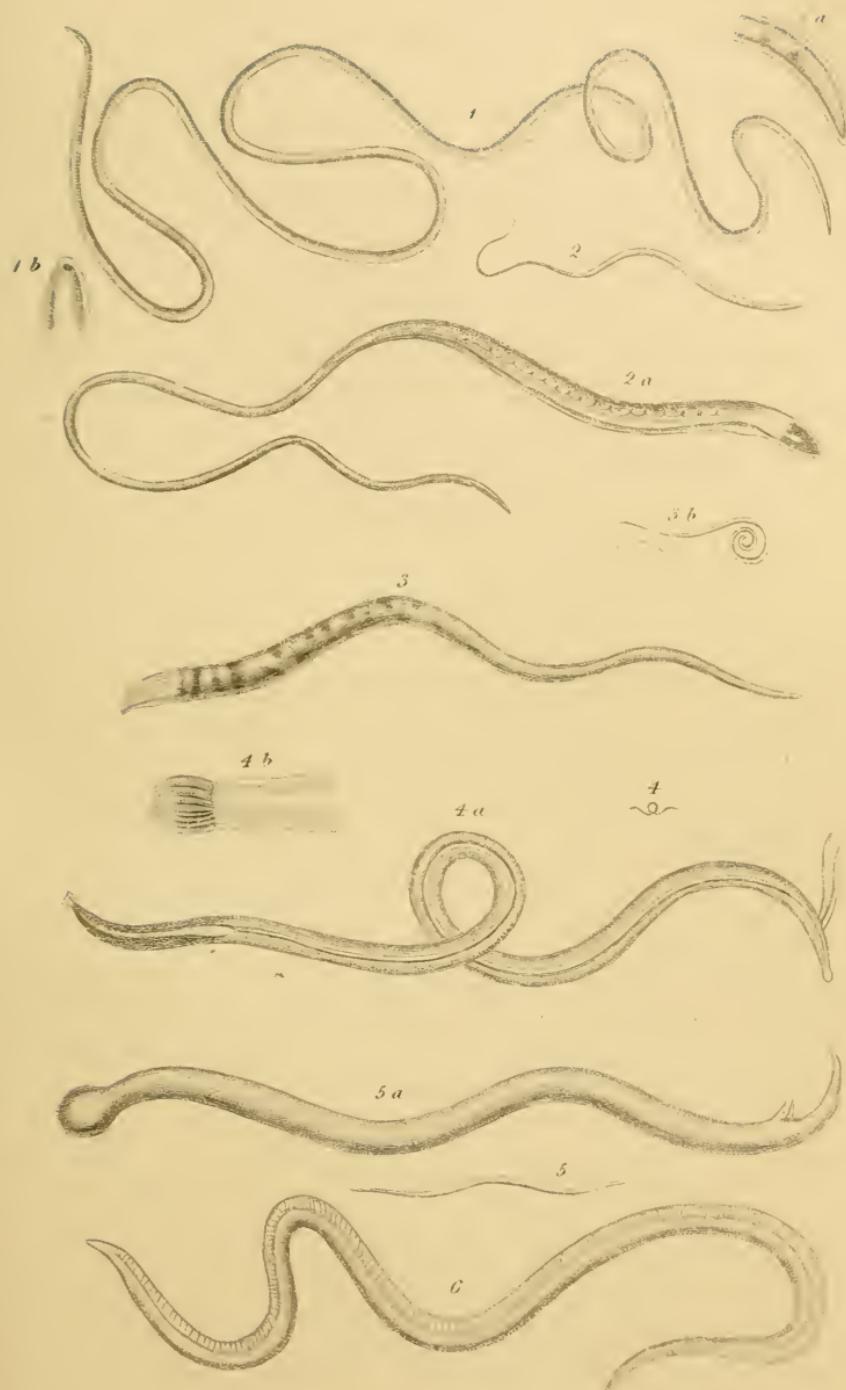
CUCULLANUS,

Have the body round, more slender behind ; the head blunt, invested with a sort of little hood, often striated ; the mouth round.

These have hitherto been found only in fish. The most common is that of the perch. *C. lacustris*, Gm. Goetz. ix. A. 3. Encyc. xxxi. 6., which also infests the pike, &c. It is viviparous, about an inch in length, of the thickness of a thread, and appears to be red, in consequence of the blood with which its intestine is usually filled.

OPHIOSTOMUS,

With the body of the preceding, are distinguished by a mouth

1 *Filaria medinensis*2 *Tricephelus dispar*3 *Oryurus curvula*4 *Cucallomitus chauncis*5 *Ophidectoma sphaeroccephala*6 *Acoet lumbrensis*

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cut cross-wise, and consequently provided as it were with two lips.

Some of them are found in the air-bladder of certain fishes, *Ophiost. cystidicola*, R. *Cystidicola*, Fisch. Monogr.

ASCARIS,

Have the body round, slender at both ends, and the mouth furnished with three fleshy papillæ, between which projects from time to time, a very short tube. It is one of the genera that is most numerous in species. They have been found in all sorts of animals. Those which have been dissected have exhibited a straight intestinal canal; and in the females, which form by far the greater number, an ovary with two branches has been observed, several times longer than the body, opening externally by a single oviduct, towards the interior fourth of the length of the animal. The males have but a single seminal tube, also much longer than the body, and which communicates with a penis sometimes double, which issues forth through the anus. The latter is pierced under the extremity of the tail.

M. Otto, and M. Cloquet, consider as the nervous system of these worms, two white filaments which extend, one along the back, and the other along the belly; two other thicker threads, extending, one on the right, the other on the left, are regarded by some as muscular, by others, as vascular, or even as tracheal.

Some have the head without lateral membranes.

The most known species,

Ascaris lumbricoïdes, L., is found without any sensible difference in man, in the horse, the ass, the zebra, the hemionus, the ox, and the hog. They have been seen more than fifteen inches in length. Its natural colour is white. It sometimes multiplies to excess, and may cause mortal maladies, espe-

cially in infants, to whom it occasions a variety of affections, particularly when it ascends into the stomach.

Other species have a small membrane on each side of the head. Such is,

Ascaris vermicularis, L. Götz. v. 1—6. Encyc. Meth. Vers. xxx. pl. x. 1. So common with infants, and in certain maladies of adults, in whom it produces an insupportable itching at the anus. It scarcely exceeds five lines in length, and is thicker in front.

STRONGYLUS, Müll.,

Have the body round, and the anus enveloped in the male, by a sort of pouch, variously configured; and from which issus a small filament, that appears to serve the purpose of generation. The female is destitute of these latter characters, which might sometimes cause her to be taken for an ascaris.

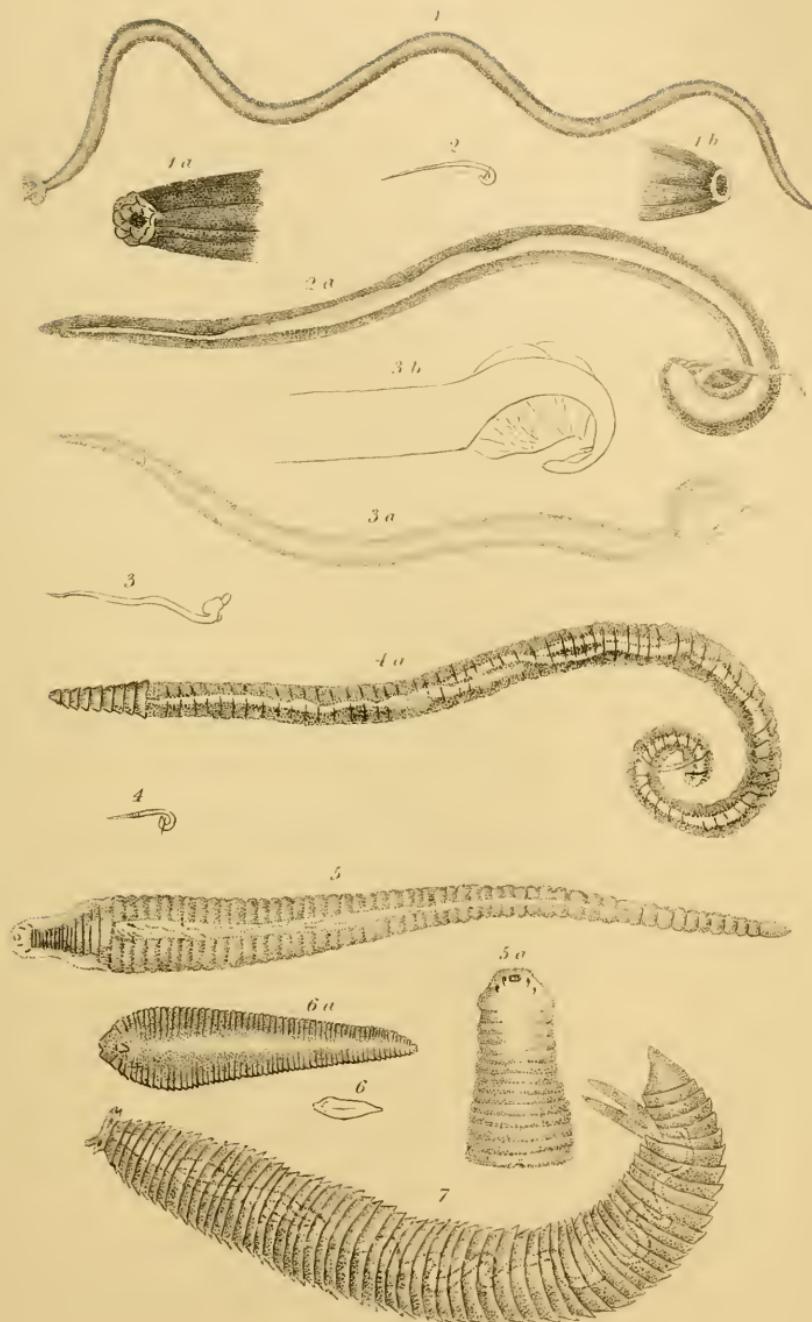
There are some of these strongyli which have ciliæ, or denticulations to the mouth. Such is

Strong. Equinus, Gm. *Str. armatus*, Rud. Müll. Zool. Dan. ii. xlvi. Enc. meth. xxxvi. 7—15. Two inches long, with a hard spherical head, mouth furnished all round with small soft spines. The pouch of the male is divided into three leaflets. It is the most common of all the worms of the horse. It penetrates even into the arteries, where it occasions aneurisms. It is also found in the ass and the mule.

Others have round the mouth, only tubercles or papillæ.

Such is particularly,

Strongylus gigas, Rud. *Ascaris visceralis*, et *Asc. renalis*, Gm. Rud., &c. The largest of the known intestinal worms; it is two or three feet long and upwards, and of the thickness of one's little finger. What is most singular is, that it is most frequently developed in one of the kidneys of divers animals;

1 *Strongylus gigas.*4 *Lierhynchus denticulatus.*2 *Spiropterus sternoplatus.* 5 *Linguatula/Pentastoma teniculus*3 *Physalopterus clausus.* 6 *Linguatula.*7 *Prienederma uscoroides*

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such as the wolf, the dog, the marten, and even man, remaining there convoluted upon itself, causing this organ to swell, destroying the parenchyma, and, in all probability, occasioning the severest pains to the individual in which it has taken up its abode. These worms have been sometimes passed in urine, while they were still small. This species also sometimes inhabits other viscera. It is often of the finest red colour. It has six papillæ around the mouth, the intestine is straight and wrinkled transversely, the ovary simple and three or four times longer than the body, communicating externally by a hole a little behind the mouth, and as it would seem, its other extremity opening into the anus. A very fine white filament which extends along the belly, has been thought by M. Otto to be the nervous system.

From the ascarides and strongyli, have been lately distinguished

SPIROPTERA,

Whose body is terminated in a spiral, surrounded with two wings, from between which the penis issues.

It is said that a species of them is sometimes found in the human bladder.

There is one in the mole, *Sp. strumosa*. Nitsch., which passes itself into a ring which it pierces in the inmost coat of the stomach, and retains itself there by a small tubercle.

PHYSALOPTERA,

In which the posterior extremity has a bladder between two small wings, and a tubercle from which the penis issues.

SCELOROSTOMA. Blain.,

Which have at the mouth six small denticulated scales.

There is one in the horse, and one in the hog.

LIORHYNCUS, Rud.,

Which have the mouth in the form of a small proboscis.

LINGUATULA, PENTASTOMA, Rud.,

Have the body depressed and trenchant on the sides ; and the transverse wrinkles are marked by strong and numerous crenulations. The skin is thin and weak ; the head is broad and flattened ; the mouth pierced underneath ; and at each of its sides are two small longitudinal clefts, from which issue little hooks. The intestine is straight ; the genital vessels long and contorted. Both have their issue at the posterior extremity. Near the mouth are two cœca, as in echinorhynkus. A white filament surrounds the mouth, and gives out two descending trunks, in which I think I have recognized some appearance of a nervous system.

This genus connects the intestina cavitaria, with the parenchymata.

One is known. *Tænia lanceolé*, Chabert. *Polystoma tænioides*, Rud. Hist. ii. xii. 8—12. ; *Pentastoma tænioides*, id. Syn. 123, which attains to nearly six inches in length. It remains in the frontal sinuses of the dog and the horse.

It is here that we should place

PRIONODERMA, Rud.,

Whose body and intestines are very similar ; but the mouth is at the anterior extremity ; simple, and armed with two small hooks.

But one is known, which attacks the silurus. *Cucullanus ascaroides*, Goetz. pl. viii. f. 2, 3. Rud. Hist. xii.

I think that we should place at the end of the intestina of this order, but as a family sufficiently different, and which should be divided into several genera, when their economy shall be better understood,

LERNÆA, L.,

Whose body has pretty nearly the same internal and external organization as that of the *intestina cavitaria*; but is prolonged in front by a neck of corneous substances, at the end of which is a mouth variously armed, and surrounded or followed by productions of divers forms. This mouth and its appendages are insinuated into the skin of the gills of fishes, and fix the animal there. The *lernææ* are further distinguished by two cords, sometimes of moderate size, sometimes very long, or even very much folded, which hang from the two sides of their tail, and which may be their ovaries.

M. Surrirey has found in the cords of a *lernæa*, some eggs, which have appeared to him to contain an animal analogous to the crustacea, and very different from the *lernæa* itself. This fact, compared with what MM. Audouin, and Milne Edwards have observed, on the *nicothoë* of the lobster, has caused those naturalists to think that the *lernææ* may be, for the most part, crustacea, grown monstrous after they have been fixed. The males would remain free, and that, according to them, would explain why we never find any but females. But to establish this opinion, it would be necessary to find these males.

LERNÆA, proper,

Have an oblong body, a long and narrow neck, and sorts of horns around the head.

The most common is that which attacks the cod and other gadi. *Lernæa branchialis*, L. Encyc. vers. lxxvii. 2., from one to two inches in length; its mouth is surrounded with three ramous horns, which are, as well as the neck, of a deep brown. Its body, more enlarged, is bent like an S, and the two cords are contorted in a thousand ways. Its horns are rooted, as it were, in the gills of fish.

Another; *L. ocularis*, Cuv., is attached to the eyes of herrings and other fish. It has only short and simple horns, two larger, and two smaller. Its body is slender, its cords long and not folded.

There is one with small horns, unequal, and very numerous. *L. multicornis*, Cuv., on the gills of a serranus, belonging to the East Indies.

Another group,

PENNELLIA, Oken.,

Has the head enlarged, furnished at the nape with two small horns, the neck corneous, the body long, wrinkled cross-wise, and furnished behind with small filaments, disposed like the barbs of feathers. The two very long filaments originate at the commencement of this pennated part.

There is a species in the Mediterranean. *Pennella filosa*, *pennatula filosa*, Gm. Boccone mus. 286. Ellis. Trans. Phil. lxiii. xx. 15., seven or eight inches long, which penetrates into the flesh of the sword-fish, the tunny, &c. and torments them horribly.

A third group,

SPHYRIONS, Cuv.

Has the head enlarged on both sides like a hammer, some small hooks at the mouth, a slender neck, followed by a depressed and heart-formed body, which, beside the two long cords, supports on each side a thick fasciculus of setæ. *Chondracanthe lisse*, Quoy et Gaim.

A fourth,

ANCHOSELLA, (Cuv.),

Is fixed to the gills only by a single production, which proceeds from the under part of the body, and is directed back-

wards. *Lernæa adunca*, Strøm. Sondmær. pl. i. f. 7, 8., common on many gadi.

A fifth,

BRACHIELLA, Cuv.,

Has two prominences, which form, as it were, two arms, and which are united in a single corneous part, by which the animal fixes itself to the gills. *Brachiella Thynni*, Cuv., &c.

A sixth,

CLAVELLA, Oken.,

Has none of these appendages, and is only fixed by the mouth.

Lernæa uncinata, Müller, &c.

These last three groups have marked hooks to the mouth. Their cords are but little elongated. There are sometimes other appendages at the posterior part of the body.

After a fresh examination, I refer to the sequel of the Lernæa.

CHONDRACANTHUS, Laroch.,

Which also have hooks to the mouth ; and on the sides of the body some appendages, very various in number and form ; so much so, that in the course of time, it will be found necessary to establish many divisions of them.

Thus some have on each side two appendages, like arms, more or less prolonged. *Lernæa radiata*, Müll., &c.

Others have many pairs of them partly forked. *Lernæa cornuta*, Id., and many new species.

Or even still more subdivided. *Chondracanthus Zei*. *Laroche*.

There are some which have a slender neck, the body widened, and very unequally indented at the edges. *Lern. triglæ*, Blainv.

I still place at the sequel of this order, an animal which,

in some measure, approximates to it, but which may one day serve as a type for a new order. It forms a genus which I name

NEMERTES, Cuv.

It is a worm extremely soft and elongated, smooth, slender, flattened, and terminated at one extremity by a blunt point, pierced with a hole; widened, and broadly open at the opposite extremity, by which it fixes itself. Its intestine traverses the whole length of the body. Another canal, probably connected with generation, winds along its parietes, and finishes at a tubercle on the margin of the wide aperture. MM. Dorbigny, and de Blainville, who have seen this animal living, assure us that the wide aperture is the mouth.

The only known species, *Nemertes Borlasii*, Cuv. Borlase. Cornw. xxvi. 13., is more than four feet long. It remains sunk in the sand, and, it is said, attacks the anomiae, which it sucks in their shell.

Near these nemertes should, probably, be placed

TUBULARIA, Renieri,

Equally large, and of a very elongated form; but which have a small mouth pierced under the anterior extremity.

OPHIOCEPHALUS, Quoy et Gaim.,

With the same forms, have the end of the muzzle cleft.

CEREBRATULA, Renieri,

Appear to differ only by having a shorter body.

THE SECOND ORDER OF INTESTINA.

PARENCHYMATA

COMPREHENDS those whose body is filled with a cellular substance, or even with a continuous parenchyma, in which we observe at most, instead of all alimentary organs, some ramified canals which distribute the nutriment, and which, in the majority, derive their origin from suckers, visible externally. The ovaries are also enveloped in this parenchyma, or in this cellular substance. There is no abdominal cavity, nor intestine, properly so called, nor anus; and if we except some doubtful vestiges in the first family, nothing is distinguishable, which has the appearance of a nervous system.

This order may be divided into four families.

The first family,

ACANTHOCEPHALA, Rud.,

Is attached to the intestines by a prominence, armed with recurved spines, which appears at the same time to serve as a proboscis. It only comprehends the genus

ECHINORHYNCUS, Gm.,

Which has the body round, sometimes elongated, sometimes in the form of a sac, provided in front with a prominence like a proboscis, armed with small hooks, bent backwards, which can be protruded or retracted, by means of particular muscles.

We sometimes observe at its extremity, a papilla, or a pore, which may be an organ of absorption, but it is also certain that the animal, when plunged in water, swells in every part, and absorbs the liquid through its entire surface, where, it has been thought, a net-work of absorbent vessels was observable. In the interior, no other part is seen comparable to intestines, except two cœca, but little prolonged, attached to the base of its prominence. It is tubiform, and on each side a vessel extends over its entire length. M. de Blainville considers as a nervous system, a filament which stretches along the inferior face, but neither M. Rudolphi, nor M. Cloquet, will have this to be the case. Certain species have a distinct oviduct. In others, the eggs are extended in the cellular substance, or the parenchyma of the body. The males have a small bladder at the end of the tail, and internal vesiculæ seminales, very distinct. It is probable that they fecundate their eggs after they are laid.

These worms attach themselves to the intestines by means of their proboscis, and frequently pierce them. Accordingly individuals are to be found in the thickness of the tunics, and even in the abdomen, adhering to the intestines internally.

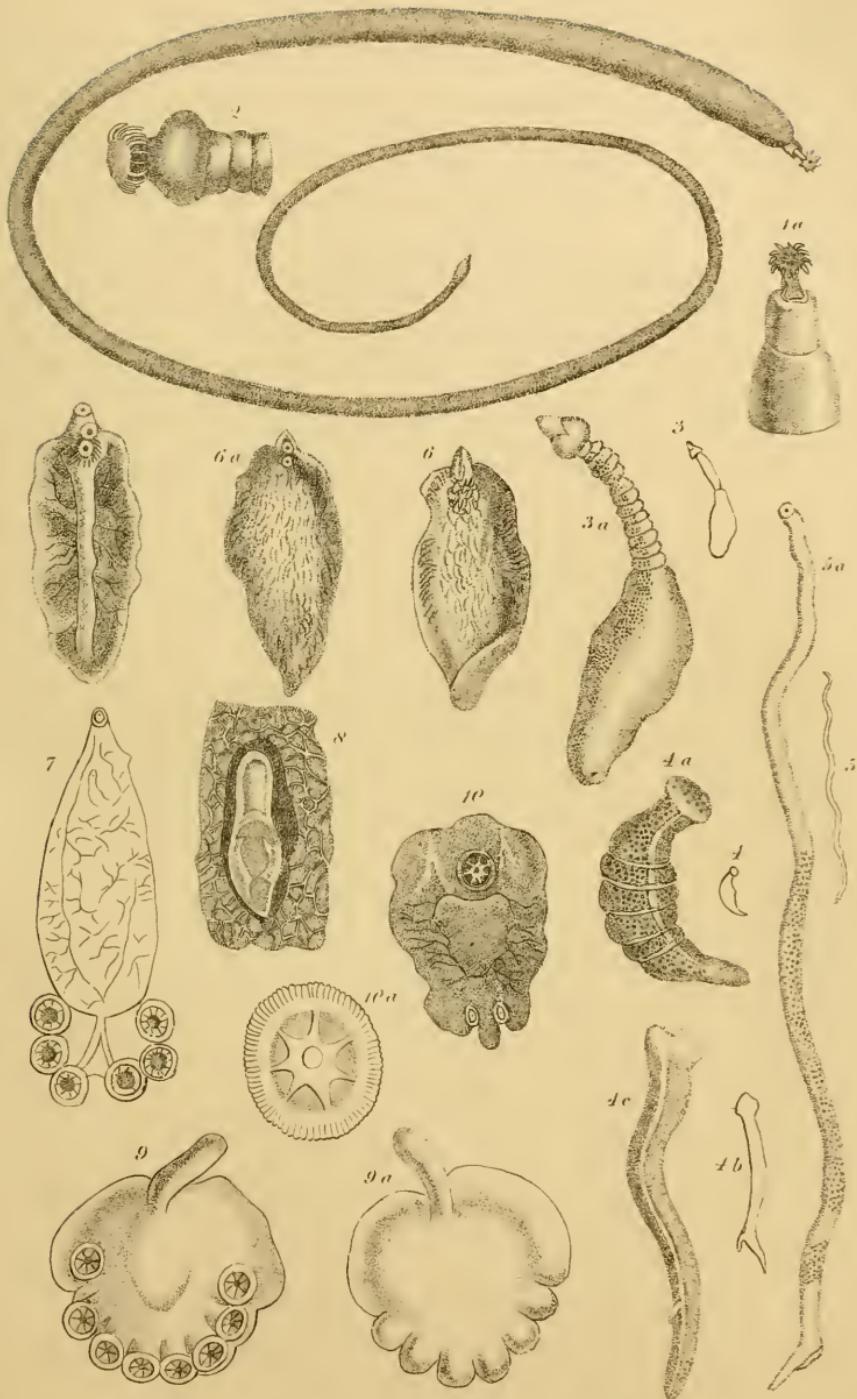
The largest species, *Echinorhyncus gigas*, Gm., Götze. 1—6. Encyc. xxxvii. 2—7, inhabits in abundance the intestines of the hog and wild boar, where the females sometimes arrive to the length of fifteen inches.

Certain species, besides the hooks of their proboscis, are armed with the like in some other part of their body.

HÆRUCA, Gm.,

Do not differ from *echinorhyncus*, except that their prominence is reduced to a single crown of spines, terminated by double hooks.

One is known which frequents the liver of rats, *Hæruca*

1 *Echinerhynchus gigas.*2 *Herrica.*3 *Amphistema longicellis.*4 *Caryophylloides mutabilis.*5 *Menestoma Bl.*6 *Distenua hepatica.*7 *Polystoma integrinum.*8 *Pol. pingueola.*9 *Cyclocytes Bidene.*10 *Tristena eucineum*

muris, Gm., *Echinorh. hæruca*, Rud., Gætz. ix. B. 12. Enc. Vers. xxxvi. 1.

The second family,

TREMADOTES, *Rud.*,

Comprehends those which have under the body, or at its extremities, some organs in the form of cuppers, by which they are attached to the viscera.

A single genus might be formed of them, to which might be given in common the name of

FASCIOLA, *L.*,

But which may be subdivided as follows, according to the number and position of the cuppers.

FESTUCARIA, *Schr.* MONOSTOMA, *Zeder.*,

Have but one copper, sometimes at the anterior end, sometimes under this same end. They are found in several birds and fishes.

STRIGEA, *Abildg.* AMPHISTOMA, *Rud.*,

Have a copper at each extremity. Some are found in several quadrupeds, birds, &c.

We should probably approximate to them

CARYOPHYLLÆUS, *Bl.*

In which he head is dilated, fringed, and has underneath a sucker furnished with two lips not very easily distinguished. Another similar sucker is sometimes perceptible under the tail.

But one is known, taken from divers fresh water fishes, and particularly common in the Bream.

DISTOMA, *Retz.* and *Zéder.*,

Have a sucker, or mouth, at the anterior extremity, and a

cupper a little farther behind, under the belly. The species are extremely numerous ; some are found even in the comb of the eye of some birds. But it also appears that some are not intestine, but inhabit at large the fresh and salt water.

The most celebrated is,

Fasciola hepatica, L., Schœf., Monogr., Copied., Encyc. Vers., pl. lxxx. i. ii., which is so common in the hepatic vessels of sheep, but is also found in those of many other ruminantia, of the hog, of the horse, and even of man. Its form is that of a small oval leaf, pointed behind, having in front a small contracted portion, at the end of which is the first sucker ; this opens into a sort of œsophagus, from which some canals proceed, ramifying through the entire body, and carrying thither the bile on which this animal is nourished. A little backwards is a small retractile tentaculum, which is the penis ; and immediately behind that is the second sucker. Some spermatic vessels, very much folded, fill the middle of the leaf. The ovary, which is found in all the individuals, is enchased in the intervals of the intestines, and the eggs issue through a convoluted canal, which ends at a small hole on the side of the penis. These animals couple reciprocally.

This worm multiplies greatly in sheep when they pasture in humid grounds, and occasions dropsy and death.

M. Rudolphi makes a division which he names **ECHINOSTOMA**, of the species which have in front a small enlargement, armed with hooks.

HOLOSTOMA, *Nitzsch.*,

Have a moiety of the body concave, and so disposed as to act altogether as a copper. Their orifices otherwise appear similar enough to those of distoma.

Some of them are found in certain birds. There is one in the fox.

POLYSTOMA, Zéder., (or more properly) **HEXASTOMA,**

Have the body depressed, smooth, and six cuppers ranged on a transverse line, under the posterior edge. Their mouth appears to be at the opposite extremity.

Some have been found in the urinary bladder of frogs, in the ovary of the human female, on the gills of some fishes, and in the nasal cavity of certain tortoise. (*Polyst. integer-rimum*, Rud., &c.)

CYCLOCOTYLES, Otto.,

Have eight cuppers forming almost a complete circle under the hinder part of the body, which is broad, and supports in front a small proboscis.

But one species is known, very small, taken on the back of the Bellone, *Cyc. bellones*, Ott. Nat. ac Eur. xi. part ii. pl. xii. f. 2.

I also approximate to the fasciolæ, a subgenus which I name

TRISTOMA, Cuv.

Their body is a broad and flat disk, behind, at its inferior face, is a large cartilaginous sucker, which is attached to the body only by a short pedicle, and under its anterior edge are found two small ones, between which, a little behind, is the mouth. In the parenchyma of the body is a ramified circular vessel, the nature of which it is difficult to determine.

A species of an inch and more in breadth, of a lively red-colour, *Tristoma coccineum*, Cuv., is attached to the gills of many fishes of the Mediterranean, such as the sword-fish, &c.

One of the most extraordinary genera of this family is that of

HECTOCOTYLES, *Cuv.*

Long worms, more thick and compressed, at the anterior extremity where the mouth is situated, whose inferior face is altogether furnished with suckers, ranged in pairs, and of a very considerable number, sixty or an hundred, and which support at the posterior extremity a sac filled with the convolutions of the oviduct.

The Mediterranean possesses a species four and five inches in length, with four hundred cuppers, which inhabits the octopus, and penetrates into its flesh. (*Hectocotyle octopodis*, Cuv., An. Sc. Nat. xviii. pl. xi.)

And another smaller, with seventy cuppers, which lives on the argonauta. (*H. argonautæ*, or *trichocephalus acetabularis*, Delle Chiaie. mem. part ii. pl. xvi. f. 1, 2.)

Perhaps it is here that should come

ASPIDOGASTER, *Bœr.*,

Which has under the belly a lamina, hollowed with four ranges of small fossettes.

There is a very small one which is a parasite of the mussels. (*Asp. conchicola*, Bœr. An. Nat. Cur. xiii. part ii. pl. xxviii.)

I cannot avoid thinking that we should still approximate to *Fasciola* the greater part of those animals comprehended under the genus

PLANARIA, *Müll.*

Although they do not inhabit other animals, but merely the fresh and salt waters. In fact, their body is depressed, parenchymatous, without any distinct abdominal cavity; the alimentary orifice, placed under the middle of the body, or more behind, and dilating into a small proboscis, conducts, as in *fasciola*, into an intestine, whose numerous ramifications

are hollowed in the thickness of the entire body. A vascular net-work occupies the sides ; behind the alimentary orifice is a double system of genital organs, and the sexual intercourse is reciprocal. Small black points are discoverable in the planariæ, which are probably eyes.

These animals are very voracious, and do not even spare their own species. They not only multiply in the ordinary way, but also very easily by division, and they sometimes even undergo spontaneous separation.

We have several of them in our fresh waters. (*Planaria lactea*, Zool., Dan., &c.)

Our coasts also abound with them, and especially with those of the largest size. (*Pl. aurantiaca*, Nob.)

There are some whose superficies appear to be hairy. (*Pl. brocchii*, Risso.)

Several have two tentacula in front. (*Pl. cornuta*, Müll.)

M. Dugés distinguishes from them

PROSTOMA,

Which have an orifice at the anterior extremity, and another at the posterior, and

DEROSTOMA,

In which the alimentary orifice is underneath, but nearer the anterior extremity.

To the first of these I approximate the PHœNICURI, Rud., or *Vertumnus Otto*, which have but one orifice at the anterior extremity.

But one species is known, *V. thetidicola*, Otto, Ac. Nat. Cur. xi. part ii. pl. xli. f. 2. A parasite of the *Thethys fimbria*, of a marked appearance, and often with a forked tail, which is the effect of laceration.

The third family of Parenchymatous intestina,

TENIOIDES,

Embraces those in which the head has two or four pores, or suckers, placed round its middle, which itself is sometimes marked by a pore, sometimes provided with a small proboscis, either naked or armed with spines. Sometimes there are four small proboscides thus armed.

Its most numerous genus is that of

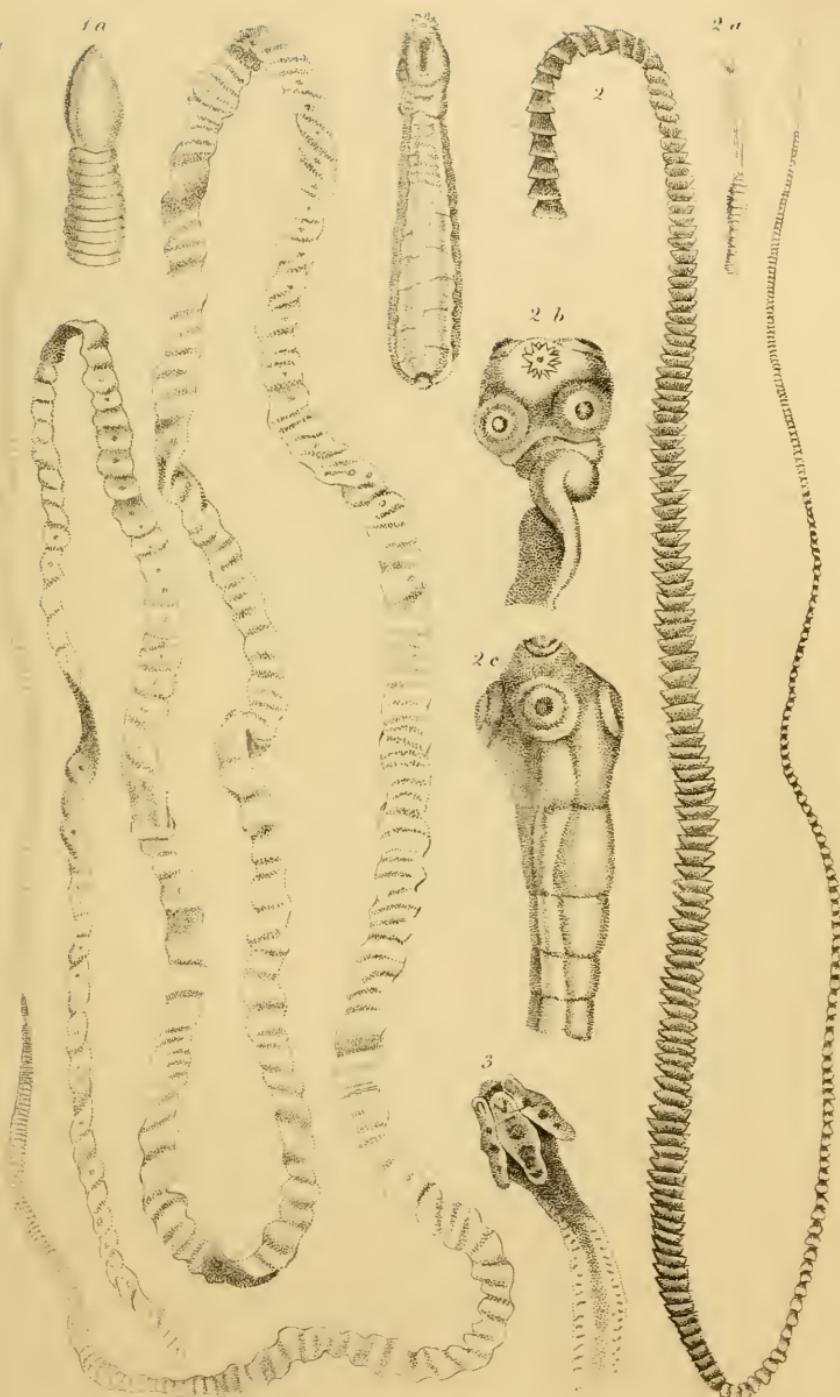
TENIÆ.

Their body elongated, often to an excessive degree, flat, composed of articulations, more or less marked, grows narrow in front, and generally supports there a square head, hollowed with four small suckers.

It has been thought that canals were perceptible, which proceed from these suckers, and extend along the margin of the articulations of the body. These last have each one or two pores, diversely placed according to the species, and which appear to be the orifices of the ovaries, which are themselves situated in the thickness of the articulations, when they sometimes assume a simple figure, and sometimes are divided into ramifications. The teniæ are in the number of the most cruel enemies of the animals in which they are developed, and which they appear to exhaust.

Some have no projecting part in the middle of the four suckers. Such is in man the

Tænia lata, Rud. *T. vulgaris*. Gm. Goetz. xli. 5—9., whose articulations are broad and short, and have a double pore in the middle of each lateral face. It is very commonly of the length of twenty feet, and it has been seen even more than a hundred. The large ones are nearly an inch in breadth; but the head and the anterior part are always very slender. It is extremely troublesome and tenacious. It is frequently found difficult of expulsion, by the most violent remedies.

1 *Tania lata.*2 *Tr. selenum*3 Head of *Bothryoceropeltis crenatus.*4 *Dibothrycerynchus lepidopterus*

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Others have the prominence between the suckers armed with small points, disposed in radii. Such is again in man,

Tenia Solium, L. Gœtz. xxi. 1—7. Encyc. xl. 15—22. xli. 1—7, whose articulations, except the anterior, are more long than broad, and have the pore alternately at one of their margins. It is in general from four to ten feet in length, but some are found much larger. It is by no means the case that but one of these worms exists in an individual at one time, as is vulgarly supposed. Its detached articulations are called *cucurbitæ*. It is one of the most dangerous of the intestinal worms, and the most difficult to be expelled.

From these common *tæniæ*, in consequence of the form of their head, have been distinguished, the

TRICUSPIDARIA, Rud.,

Which M. Rudolphi now calls TRIANOPHORA, whose head divided, as it were, into two lips or two lobes, has, on each side, instead of suckers, two stings, with three points.

But one is known which inhabits divers fish, the pike, perch, &c. *Tenia nodulosa*, Gm. Gœtz. xxxiv. 5, 6. Encyc. xlix. 12—15.

BOTHRYOCEPHALUS, Rud.,

Whose head, instead of suckers, has only two longitudinal fossettes, placed opposite one to the other.

Some are found in various fish, and in some birds.

Among the Bothryocephali themselves, it is proper to distinguish

DIBOTHRYORHYNCUS, Blain.,

Which have at the summit two small proboscides, or tentacula, bristling with hooks.

But one is known, with a short body; lives in the lepidopus.
Blainv. App. ad Brems. pl. ii. p. 8.,

FLORICEPS, Cuv.,

Which have four small proboscides, or tentacula, armed with recurved spines, by means of which they bury themselves in the viscera.

Certain species,

RHYNCOBOTHRIUM, Blain.,

Have the body long, articulated, and without bladder.

There is one sufficiently common in the rays; *Bothryocephalus corollatus*, Rud. ix. 12., some inches in length. Its head altogether resembles a flower.

Some others,

FLORICEPS,

Properly so called, have the body terminated by a bladder, into which it enters and is concealed.

TETRARHYNCUS, Rud.,

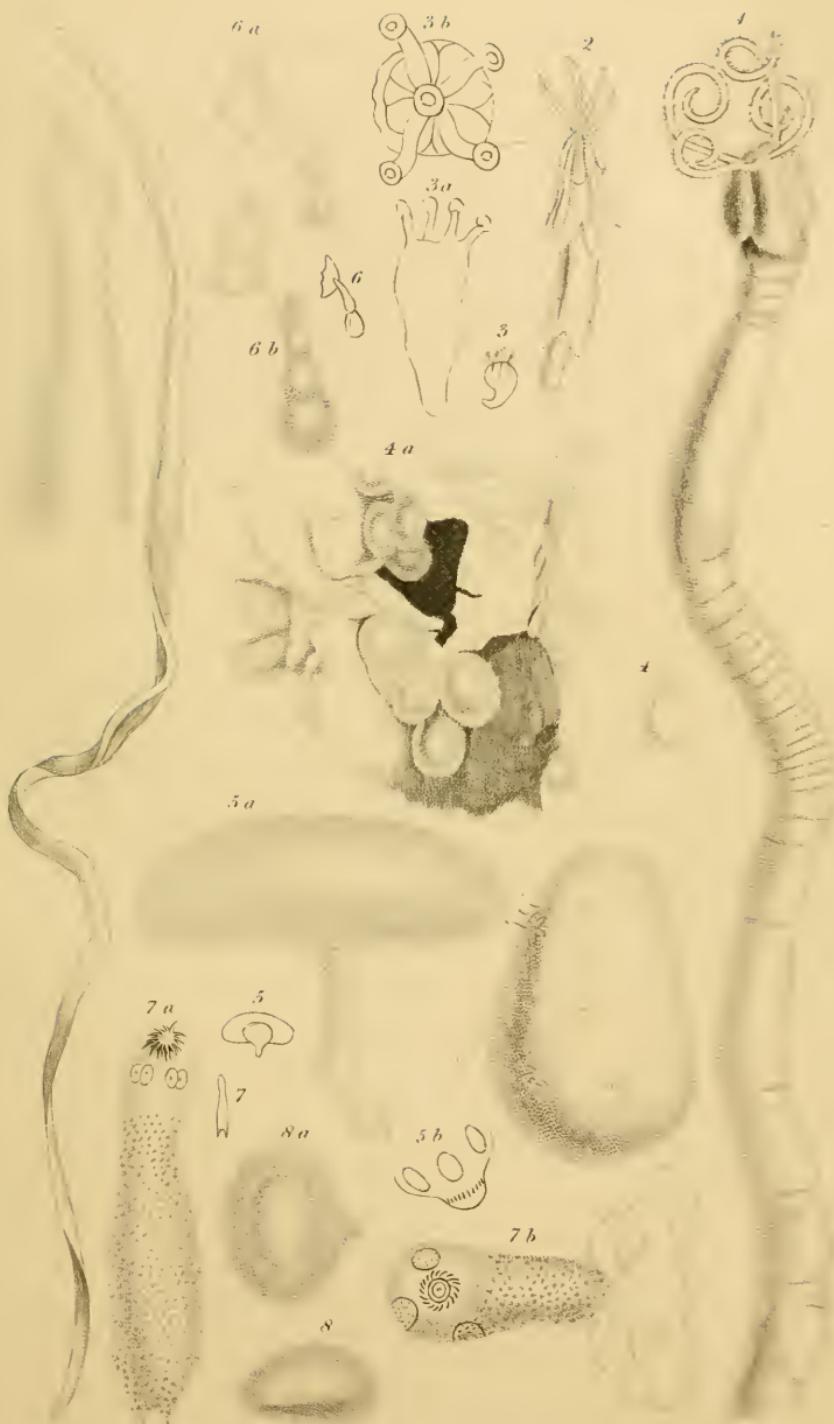
Appear to be only floriceps, reduced naturally to the head, and two articulations, instead of an elongated body, and several articulations.

One is found very commonly in the flesh of the tongue of the turbot, and of several other fishes. *Tetr. lingualis*, Cuv.

TENTACULARIA, Bosc.,

Differ only in the tentacula not being armed with spines.

Those have also been distinguished from the ordinary tæniæ, which, with a head similar to theirs, that is to say, with four suckers, have the body terminated behind by a



1 *Floriceps cerebellatus.* 5 *Cysticercus finnoi*
 2 *Tetrahydnum lingualis.* 6 *Ierestrum annulatum*.
 3 *Tintacularia Besseyi.* 7 *Canarius cerebralis*.
 4 *Cysticercus pisiformis.* 8 *Echimecercus*.
 9 *Ligula simplicissima.*

bladder. Their articulations are not as distinct as in the preceding.

CYSTICERCUS, Rud. Vulgò. **HYDATIDES**,

Are those in which the bladder supports but a single body, and a single head. They are particularly developed in the membranes, and the cellular substance of animals.

There is one species which multiplies in a great number of quadrupeds, especially in the ruminantia. It is the *globular hydatid* (*Tænia ferarum*; *T. caprina*; *T. ovilla*; *T. bovina*; *T. apri*; *T. globosa*, Gm.) Gœtz. xvii. A.B. Encyc. xxxix. 6—8.

Another is very common in hares and rabbits; *Tænia cor-data*; *T. pisiformis*; *T. utricularis*, Gm. Gœtz. xviii. A.B. Encyc. xxxix. 6—8.

But the most celebrated is that which remains between the fibres of the muscles of hogs, and produces what is called in them measles. *Tænia cellulosa*, and *T. finna*, Gm. Blum. Abb. 4. Cah. pl. 39. It is small, and multiplies excessively in this disgusting malady, penetrating even into the heart, the eyes, &c. It appears that similar ones have been observed in some apes, and even in man. But it is said never to be found in the wild boar.

ACROSTOMA, Le Sauvage. Ann. des Sc. Nat.,

Is very much akin to this genus. It lives in the amnios of cows.

CŒNURUS, Rud.,

Have several bodies and several heads, attached to the same vesicle.

One very celebrated species is known; *Tænia cerebralis*, Gm. Gœtz. xx. A.B. Encyc. xl. 1—8., which is developed

in the brain of sheep, destroys a part of its substance, and occasions a sort of paralysis, called the *staggers*, because it causes them to turn round involuntarily as if they were giddy. Some of these worms have also been seen in oxen, and other ruminants, in which they produce the same effects. The vesicle is sometimes as big as an egg. Its parietes are very slender, fibrous, and exhibit sensible contractions. The small worms are scarcely half a line in length, and enter the vesicle by contraction.

Here should, probably, come the genus,

ECHINOCOCCUS, Rud.,

But I have not observed it, nor can I form a sufficiently distinct notion of it, for the purposes of classification.

SCOLEX, Müll.,

Have the body round, pointed behind, very contractile, and terminated in front by a sort of variable head; round which are two or four suckers, sometimes in the form of ears, or small tongues.

Only some very small ones are known, taken from some fish.

I have seen a large one; *Scol. gigas*, Cuv., which penetrates into the flesh of a species of bream, the *sparus raii*, L. the middle part of the body of which is inflated into a bladder, which in the living state contracts or enlarges alternately in its middle. It is the *gymnorynchus reptans*, Rud. Syn. 129.

The fourth family,

CESTOIDES,

Comprehends those in which no external suckers are observed.

But a single genus is known.

LIGULA, Bloch.,

Are, of all the intestina, those which appear to be the most simply organized. Their body resembles a long riband. It is flat, obtuse in front, marked with a longitudinal stria, and finely striated cross-wise. No external organ is distinguishable, and in the interior, nothing is seen but eggs, variously distributed through the length of the parenchyma.

They live in the abdomen of some birds, and more particularly in that of several fresh-water fish, whose intestines they envelope and press to such a degree, as to cause them to perish. At certain periods, they even pierce their abdomen to get out.

There is one in the bream. *Lig. abdominalis*, Gm. *L. cingulum*, Rud. Gøtz. xvi. 4—6, which attains even to the length of five feet. These worms, in some parts of Italy, are considered as an agreeable food.

THE THIRD CLASS OF THE ZOO PHYTES.

ACALEPHÆ, *Vulg.* SEA-NETTLES,

Comprehend zoophytes which swim in the waters of the sea, and in the organization of which some vessels are perceived which, in truth, are most frequently only productions of the intestines, hollowed in the parenchyma of the body.

THE FIRST ORDER OF ACALEPHÆ.

ACALEPHÆ SIMPLICES,

Float and swim in the waters of the sea, by means of the contractions and dilatations of their body, although their substance is gelatinous, without any apparent fibres. The sorts of vessels which are seen in some of them, are hollowed in the gelatinous substance. They often come from the stomach in a visible manner, and do not give rise to any true circulation.

MEDUSA, L.,

Have a disk more or less convex above, similar to the head of a mushroom, and to which the name of *umbrella* has been given. Its contractions and dilatations concur in producing the movements of the animal. The edges of this umbrella, as well as the mouth, or the suckers, more or less prolonged into pedicles, which take its place, at the middle of the inferior face, are furnished with tentacula of very various forms and sizes. These different degrees of complication have given rise to very numerous divisions.

We shall give the general name of

MEDUSA (proper),

To those which have a mouth under the middle of the inferior surface, whether simply opening on the surface, or prolonged into a pedicle. And among the medusa proper

We may unite under the name of

ÆQUOREA,

All those in which this mouth is simple and not prolonged or furnished with arms.

When they have no tentacula around the umbrella, they constitute the **PHORCYNIA** of Lamarck.

When the umbrella is furnished with tentacula all around, it characterizes the **ÆQUOREA**, more particularly so named, of Peron, one of the most numerous subgenera, especially in the seas of hot climates. *Medusa æquorea*, Gm. &c. &c.

Certain species are remarkable for laminae, which furnish their inferior surface. Others, **FOVEOLIA**, Peron, are signalized by little fossettes, hollowed in the circumference of the umbrella. *Medusa mollicina*, Forsk., &c.

We may thus unite under the name of

PELAGIA,

Those in which the mouth is prolonged into a peduncle, or divided into arms. *Pelagia panopyra*, Peron.

In all these subgenera, there are no lateral cavities; but a much greater number of these medusæ, with simple mouths, have in the thickness of the umbrella four organs, formed of a plaited membrane, filled at certain periods with an opake substance, and which appear to be ovaries. They are most frequently lodged in as many cavities, open at the inferior face, or on the sides of the pedicle; and which, as I think, have been erroneously taken for mouths, because some little animals are occasionally caught in them. Some naturalists take them for organs of respiration; but it is more probable that this function is exercised on the margins of the umbrella. The tentacula, whether of the margin of the umbrella, or the circumference of the mouth, vary not only according to the species, but even according to age.

We unite under the name of

CYANEA, Cuv.

All the medusæ with central mouth, and four lateral ovaries.

The most extended, *Medusa aurita*, L. Müll. Zool. Dan.

lxxvi. and lxxvii., acquires with age four long arms. Its umbrella is finely ciliated all around. Some reddish vessels pass from the stomach to the circumference, subdividing in their course.

Another, *Med. chrysaora*, Cuv., has the edges furnished with long tentacula, and some fulvous or brown lines or spots, disposed in radii in its convexity. It is also very common, and varies much as to the spots.

We have given the general name of RHIZOSTOMA, to a portion of the great genus MEDUSA, comprehending the species which have no mouth open at the centre, and which appear to be nourished through the suction of the ramifications of their pedicle, or of their tentacula. They have four ovaries or more.

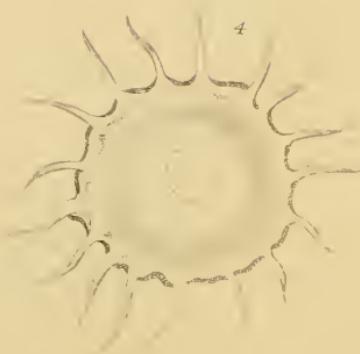
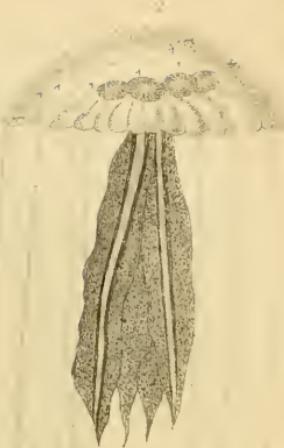
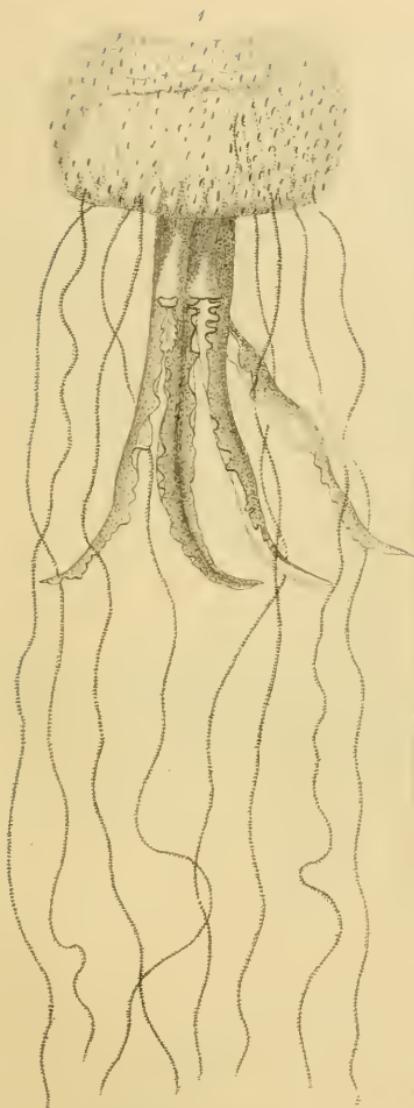
RHIZOSTOMA, (proper) Cuv.,

Are those which have in the middle a pedicle, more or less ramified, according to the species.

The vessels proceeding from the small ramifications of the pedicles, unite in a cavity of its base, from which branches proceed for all the parts of the umbrella.

The most common is the *Rhizostome bleu*. Cuv. Jour. de Phys. tom. xlix. p. 436. Reaum. Acad. des Sc. 1710. pl. xi. f. 27, 28. It is found every where on the sand of our coasts, when the sea retires, and its umbrella is sometimes nearly two feet in breadth. Its pedicle is divided into four pairs of arms, forked and denticulated almost *ad infinitum*, furnished each at the base with two corslets, equally denticulated. The umbrella has all around, in the thickness of its margins, a fine net-work of vessels.

According to the observations of Messrs. Audouin, and Milne Edwards, these medusæ live in society, or at least are always to be met with united in great numbers, and swimming in the same direction, the body being inclined obliquely.

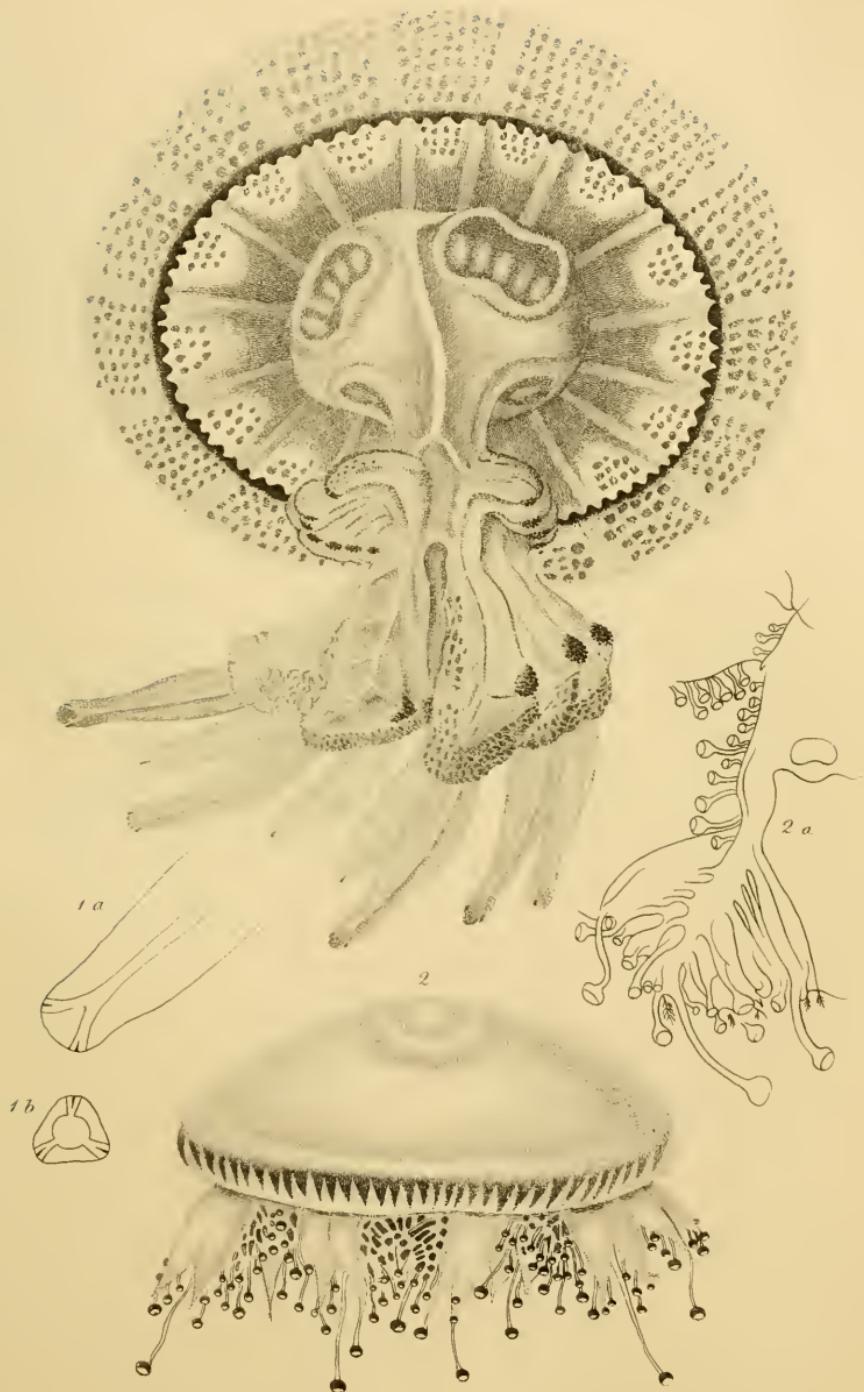


1 *Pelata panopaea*

2 *Cyanora Laiiche*

3 *Spotted cyanotrichia*

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1 *Rhizostoma Aldrovandi.*

2 *Caisiopea borbonica.*

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CEPHÆA, Peron, are distinguished from the other Rhizostoma only by some filaments mixed with the denticulations of their pedicle. *Medusa Cephæa*, Forsk., &c.

The CASSIOPÆÆ have, properly speaking, no pedicle; their arms usually eight in number, sometimes branched, spring immediately from the inferior surface. *Med. Frondosa*, Pallas, &c.

Other species, without a central mouth, have none of these numerous ramifications to the pedicle, nor open cavities to lodge the ovaries. They may be united under the name of

ASTOMA.

Some, however, have still a large pedicle, furnished on each side with hairy filaments, which may serve as suckers. LYMNOREA and FAVONIA, Per.

Others have not even these filaments, but a membrane in the form of a funnel at the end of the pedicle, and from the bottom of which the vessels appear to issue, which ascend into the pedicle, and spread out in the umbrella. *Geryonia*, properly so called; Peron. There is one in the Mediterranean; *Med. proboscidalis*, Forsk. xxxvi. 1.

This membrane is even wanting in others. ORYTHIA, id. *Medusa minima*, Bart., &c.

There are some without any pedicle, but in which the under part appears furnished with small suckers along the passage of the vessels. BERENICE, Peron. *Cuvieria eurisochroma*, Peron.

Finally, there are some in which no suckers are perceptible, the two surfaces being smooth, and without apparent organs. EUDORA, Peron.

The Mediterranean possesses a species of these about the size of a five-franc piece, and to which the people give the name of that coin. *Eud. moneta*, N.

When these very simple animals assume more concavity, their

inferior surface becomes interior, and may perhaps be regarded as a true stomach. These are the CARYBDEA, Peron. Those in whose interior no traces of vessels are perceptible, do not properly differ from the *hydræ*, but in size. *Medusa marsupialis*, Gm.

It has been found necessary to separate from the medusæ, some genera united to them by Linnæus, on very slight grounds of relation, such as

BEROE, Müll.

They have an oval or globular body, furnished with projecting ribs, bristling with filaments or fringe, proceeding from one pole to the other, and in which we perceive vascular ramifications, and a sort of movement of the fluid. The mouth is at one extremity ; in those which have been examined, it conducts into a stomach which occupies the axis of the body, and on the sides of which are two organs probably analogous to those which we have called ovaries in the medusa.

Such is,

Medusa pileus, Gm. (*Globular Beroë*) Baster. i. iii. xiv. 6—7. Encyc. xc. 3, 4, with a spherical body, furnished with eight ribs ; two ciliated tentacula, susceptible of a great elongation, issue from its inferior extremity. It is very common in the north seas, and even in the channel on our coasts, and is considered as one of the aliments of the whale.

According to MM. Audouin and Milne Edwards there exists in the axis of these animals a cavity which goes from one pole to the other, and which communicates externally by means of an inferior aperture, which may be considered as the front mouth. In the superior third of this cavity is contained, and as it were suspended, a sort of straight and cylindrical intestinal tube, which has its external aperture immediately at the superior pole, and which supports on each side two granular cords (ovaries perhaps). The cavity is filled with a

fluid in motion, which is seen to pass into two lateral tubes, that soon subdivide each into four branches, and terminate on the surface of the body, by opening into longitudinal canals. Through these canals the fluid is conducted into the ciliae, which are constantly in motion, and appear to be respiratory organs. Finally, from the sides of each of the eight costal canals, spring an infinity of small vessels, or transverse sinuses, which establish a communication between them, and which sink into the surrounding parenchyma. On each side of the spheroid, and internally, we perceive two small masses which occupy each the bottom of a cavity or cul-de-sac, and give birth to two long contractile filaments, issuing through two circular apertures, situated towards the inferior third of the body. These filaments are subsequently divided into a great number of branches.

To this genus have been referred some more simple species, which merely resemble a sac, furnished with ciliated ribs, and open at the two ends. IDYA. Oken. *Beroë ovatus* Brug. or *Medusa infundibulum*, Gm.

There are some which are even destitute of ribs, and whose form represents that of a band without bottoms. DOLIOLUM. Otto. *D. Mediterraneum*, Otto.

CALLIANIRA, Peron, do not appear to differ from Beroë, except in having much more projecting ribs, united two by two, to form two sorts of wings. Their internal organization is not sufficiently known. *Callianira didiploptera*, Peron.

JANIRA, Oken., appear to be akin to the callianiræ; but on each side there are three large ciliated ribs, and two long filaments divided into branches. *Beroë hexagone*, Brug. Encyc. vers. pl. 90. f. 6.

ALCINOE, Rang., have the body cylindrical, open at one extremity, furnished on the other with two large wings, which by being folded over it, can envelope it altogether. Its cylindrical part is flanked with four projecting ribs, each termi-

nated in a point, and has eight lines of ciliæ. *Alcinoe vermiculata*, Rang.

OCYROE, id., have the same sort of body with four ranges of ciliæ, but without ribs; they have also similar wings, each furnished at the base with two ciliated points. *Ocyroë maculata*, id., &c.

It is also near Beroe that we should place

CESTUM, Lesueur,

A very long gelatinous ribbon, one of the edges of which is furnished with a double range of ciliæ. The inferior one has some also, but smaller, and less numerous. It is at the middle of the inferior margin, that the mouth is situated; a large aperture which leads into a stomach, pierced through the breadth of the ribbon, and proceeding to a very small anus. From the extremity near the anus, proceed some vessels, which extend to the two extremities of the ribbon. At the sides of the mouth two sacs open, which are probably the ovaries. This animal may be compared to a callianira with two ribs, and whose wings were excessively prolonged.

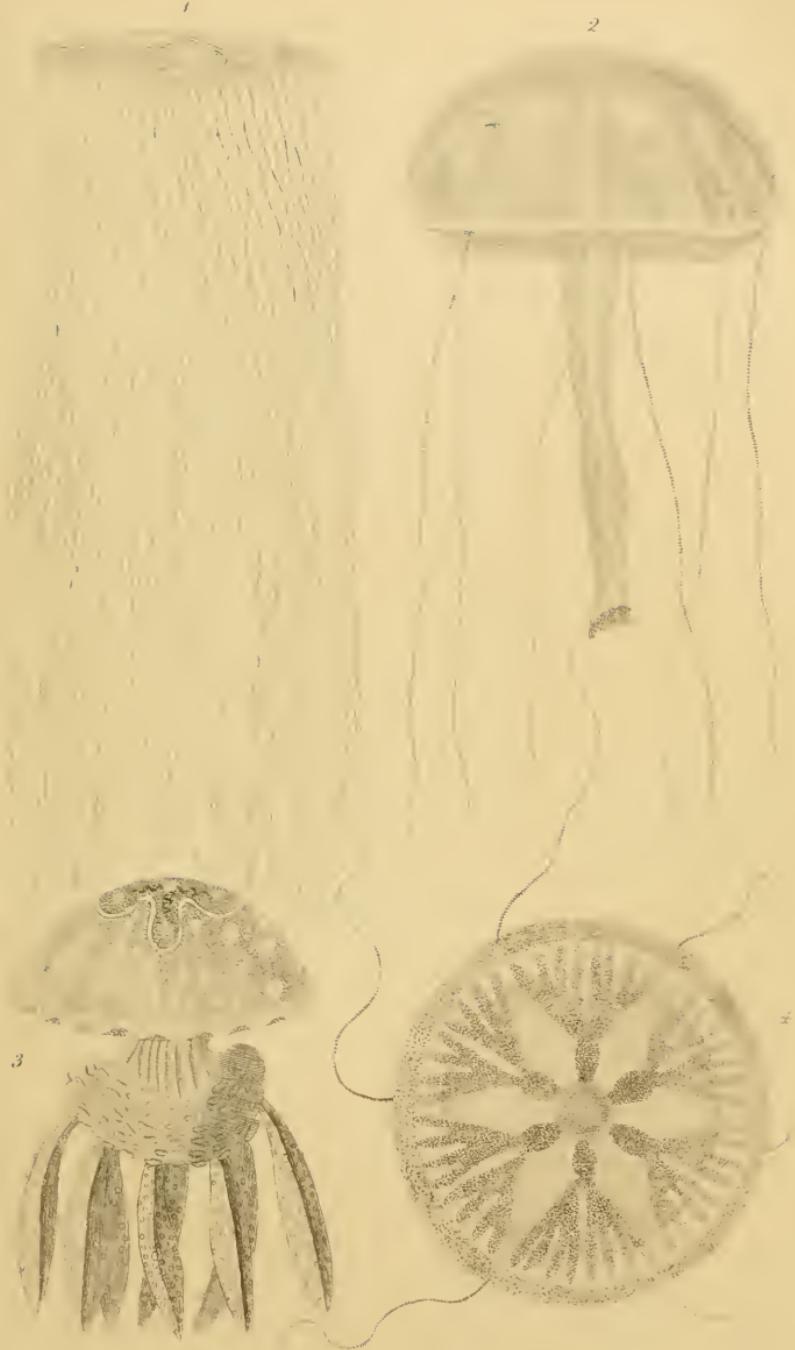
The only known species,

Cestum veneris, Lesueur. Nouv. Bull. des Sc. June 1813. pl. v. f. 1., is from the Mediterranean. Its length, or rather its breadth, is more than five feet; its height, two inches. It is preserved entire with great difficulty.

The two following genera, which have also been united to the medusæ, might form a small family in this order, in consequence of the internal cartilage which supports the gelatinous substance of the body.

PORPITA, Lam.,

Have this circular cartilage, and its surface marked with concentric striæ, crossing with radiating striae. At the upper face it is clothed only with a slender membrane, which

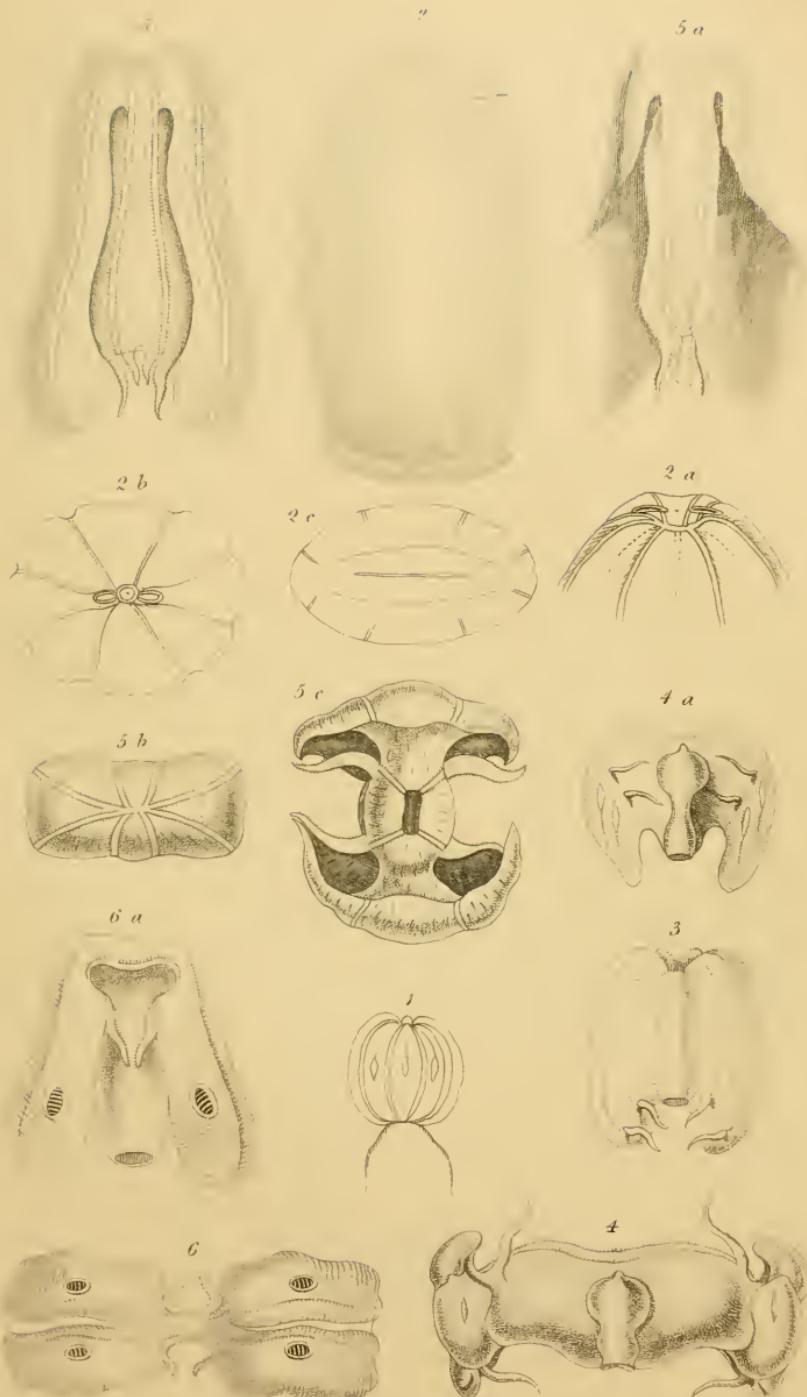


1 *Beracea curvistoma*

2 *Geryraea proboscidea*

3 *Cepaea papilio*

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1 *Beroe pilosa*

4 *Colliantra bucephalon*

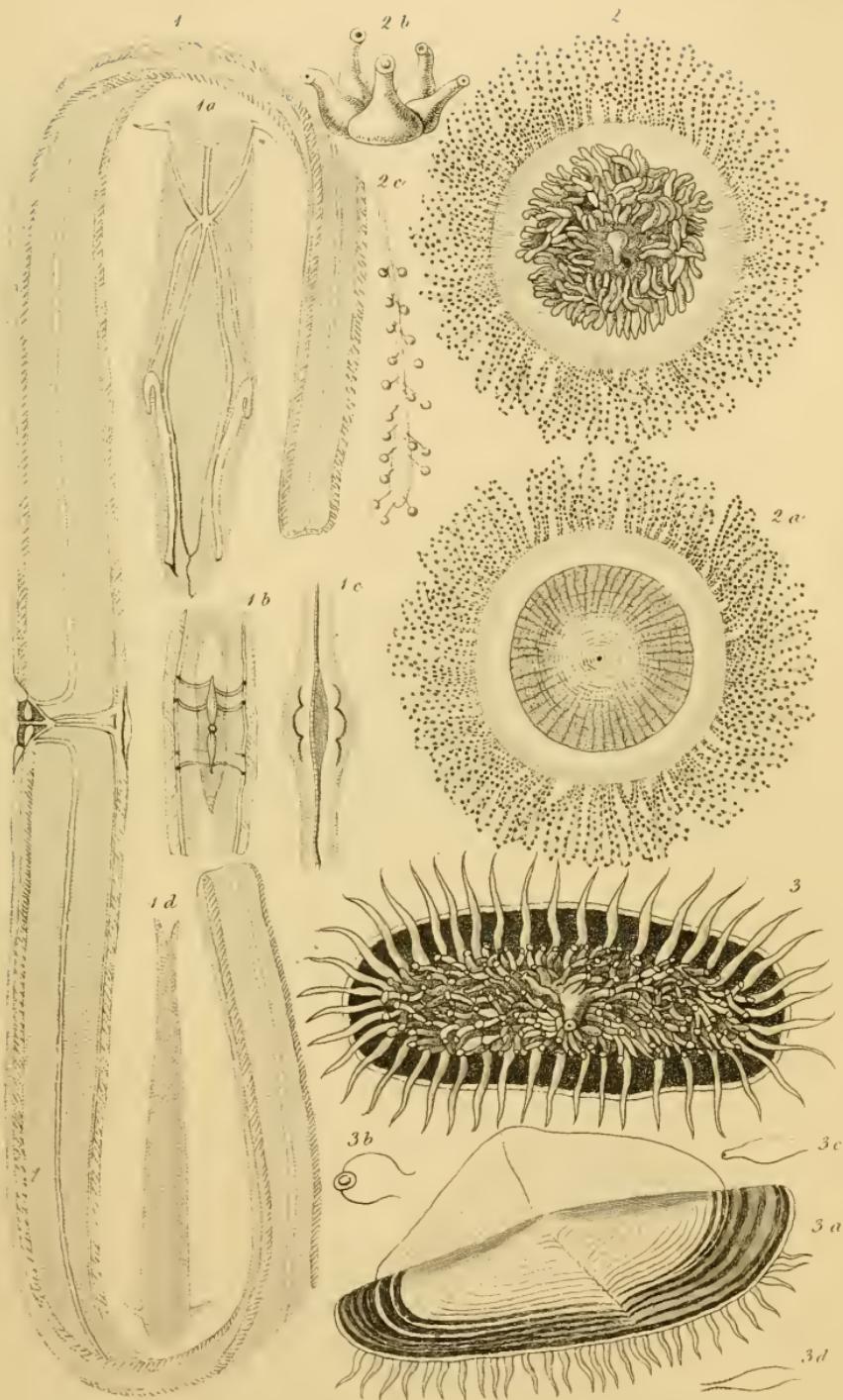
2 *Ber. Idvai* *longigaster*

5 *Heiner vermiculata*

3 *Beroe vestita*

6 *Cyrene maculata*

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1 *Cestrum veneris.*

2 *Porpita chrysocema.*

3 *Velella limbesa.*

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out-edges it. The inferior is furnished with a great number of tentacula, of which the external ones are longer, and furnished with little ciliae, terminated each by a globule. They sometimes contain air; the middle ones are shorter, more simple and more fleshy. At the centre of all these tentacula is the mouth, in the form of a small projecting proboscis. It conducts to a simple stomach surrounded with a sort of glandulous substance.

But one species is known of a fine blue, belonging to the Mediterranean, and to warmer seas. (*Medusa umbella*, Müll.)

VELELLA,

Have, like the porpitæ, at the inferior face, a mouth in the form of a proboscis, surrounded with innumerable tentacula, of which the external ones are longer; but the latter are not ciliated, and what gives a more important character is, that the cartilage, which is oval, has on its upper face a vertical crest placed obliquely, and sufficiently raised. This cartilage is transparent, and has only concentric striae.

One species is also known of the same colour, and living in the same seas, as the porpita. It is eaten fried. It is the *Medusa velella*, and *Holothuria spirans* of Gmelin.

THE SECOND ORDER OF ACALEPHÆ.

ACALEPHÆ HYDROSTATICÆ,

ARE recognized by one or more vesicles, usually filled with air, by means of which they are suspended in the water. Appendages singularly numerous, and varying in form, some

of which probably serve as suckers, others perhaps as ovaries, and others, longer than the rest, as tentacula, unite themselves to these vesicular parts, to compose the whole apparent organization of these animals. There is no mouth that can properly be recognized as such.

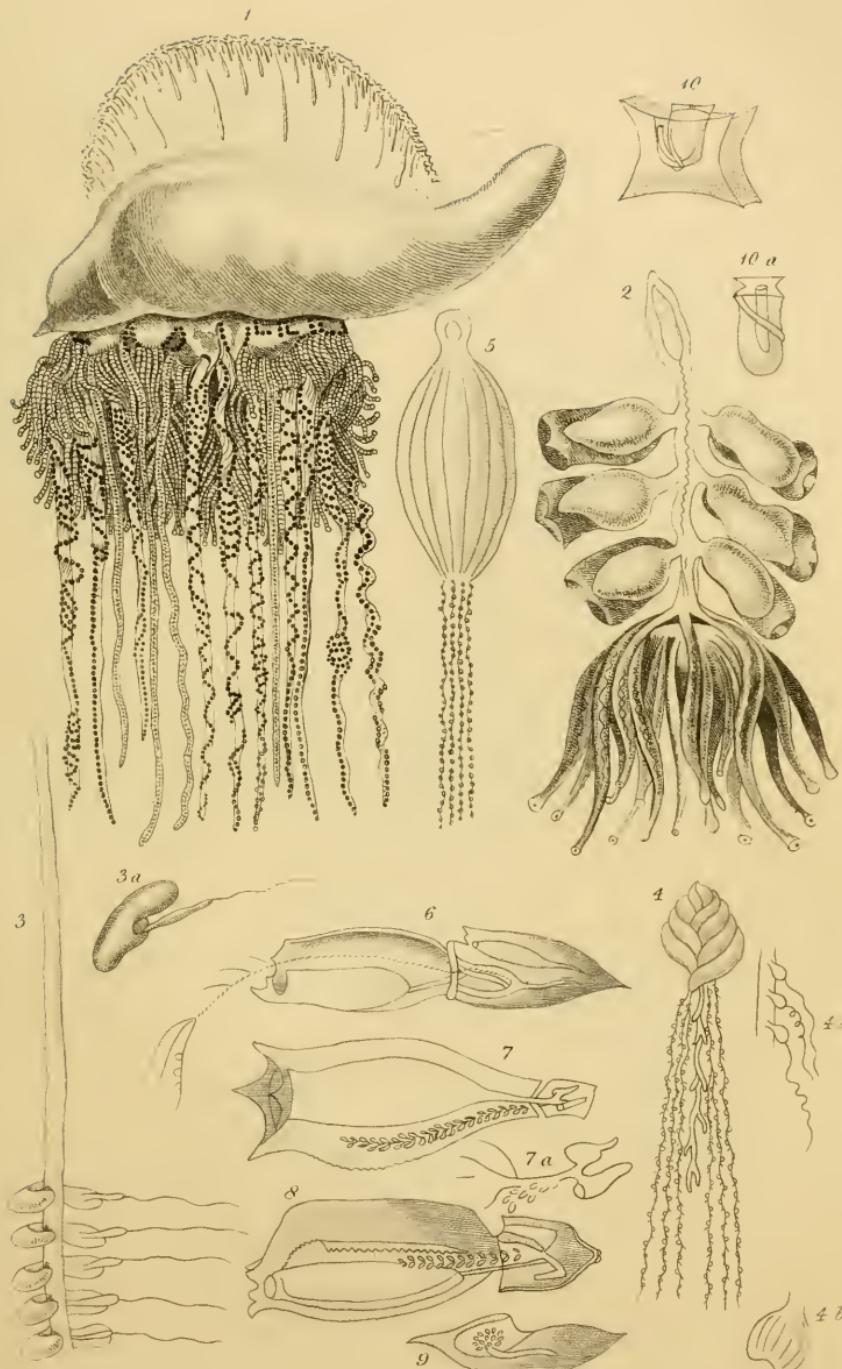
PHYSALIA, Lam.,

Consist of a very large oblong vesicle, raised above into a projecting crest, oblique and wrinkled, and furnished underneath, towards one of its extremities, with a great number of cylindrical fleshy productions, which communicate with the vesicle, and terminate variously. Those towards the centre support groups, more or less numerous, of small filaments; those towards the sides are only bifurcated into two filaments, one of which is often very much prolonged. One of the extremities of the vesicle appears to have a very small orifice. But in the interior, we find, instead of intestine, only another vesicle, with more slender parietes, and which has some cœca extending partly into the cavities of the crest. For the rest, there is neither nervous, nor circulating, nor glandular system. The animal swims on the surface of the sea when it is calm, and employs its crest as a sail. It also has, in the living state, some very long filaments, more slender than the others, and sown, as it were, with pearls, or little drops. It is reported that their touch stings like that of the nettle.

There are some in all the seas of warm climates. (*Holothuria Physalis*, L., &c. &c. &c.)

PHYSSOPHORA, Forsk.,

Have sensible relations with the Physaliæ; but their bladder is much smaller in proportion, without a crest, often accompanied with lateral vesicles, and their various and numerous tentacula are suspended vertically under this vesicle, as a garland or a cluster of grapes.

1 *Physalia atlantica*6 *Diphia dispar*.2 *Physsephera disticha*7 *Calpe pentage* a... Quoy and Gaim.3 *Phys. nivea*8 *Abyla trigona*, L. Jid.4 *Hippodius luteus*9 *Cymba sagitta*5 *Rhizophea heliantha*10 *Cubooides vitreus*.

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In

PHYSSOPHORA, (proper) *Peron*,

Between the superior vesicle and the tentacula, are found other vesicles, placed side by side, or one above the other, and of a form sometimes irregular, sometimes polyhedral, and forming by their union, prisms or cylinders; the tentacula, partly conical, partly cylindrical, partly formed of groups of filaments, or of globules, some in fine filiform, and susceptible of great elongation, form a cluster, or garland, at the inferior extremity. (*Physsophora hydrostatica*, Gm., &c. &c.)

HIPPOPUS, *Quoy and Gaim.*

Have only lateral vesicles, almost semicircular, or in the form of a horse's hoof, crowded on two ranges, and thus forming a sort of ear, like that of certain grains, from which also hangs a garland, which traverses all those pieces. The contractions of those vesicles impress upon the whole a rapid movement.

CUPULITES,

Have their vesicles attached regularly on both sides of an axis, often very long.

RACEMIDES, *Cuv.*,

Have all their vesicles globular, small, furnished each with a small membrane, and united into an oval mass, which is moved by their combined contractions.

RHIZOPHYZA, *Peron*,

Have no lateral vesicles, but only a superior vesicle, and a long stem, along which the tentacula are suspended; some conical, others filiform. (*Physsophora filiformis*, Forsk.)

STEPHANOMIA, Peron,

Appear to be a third combination, in which the lateral vesicles, which, in the Physsophoræ proper, adhere to the top of the stem, above the tentacula, are prolonged over its length, and mingled with tentacula of various forms. (*Stephanomia amphitritis*, Peron.)

It is at the end of the hydrostatic acalephæ, that may be placed

DIPHYES, Cuv.

A very singular genus, in which two different individuals are always found together, one being emboxed in a cavity of the other, which arrangement, however, permits them to separate without destruction to individual life. They are gelatinous, transparent, and move pretty nearly like the medusæ. The one which receives the other, produces from its cavity, a chaplet which traverses a semi-canal of its companion, and appears to be composed of ovaries, of tentacula, and of suckers, like those of the preceding genera.

MM. Quoy and Gaymard, have established divisions in this genus, according to the forms and relative proportions of the two individuals.

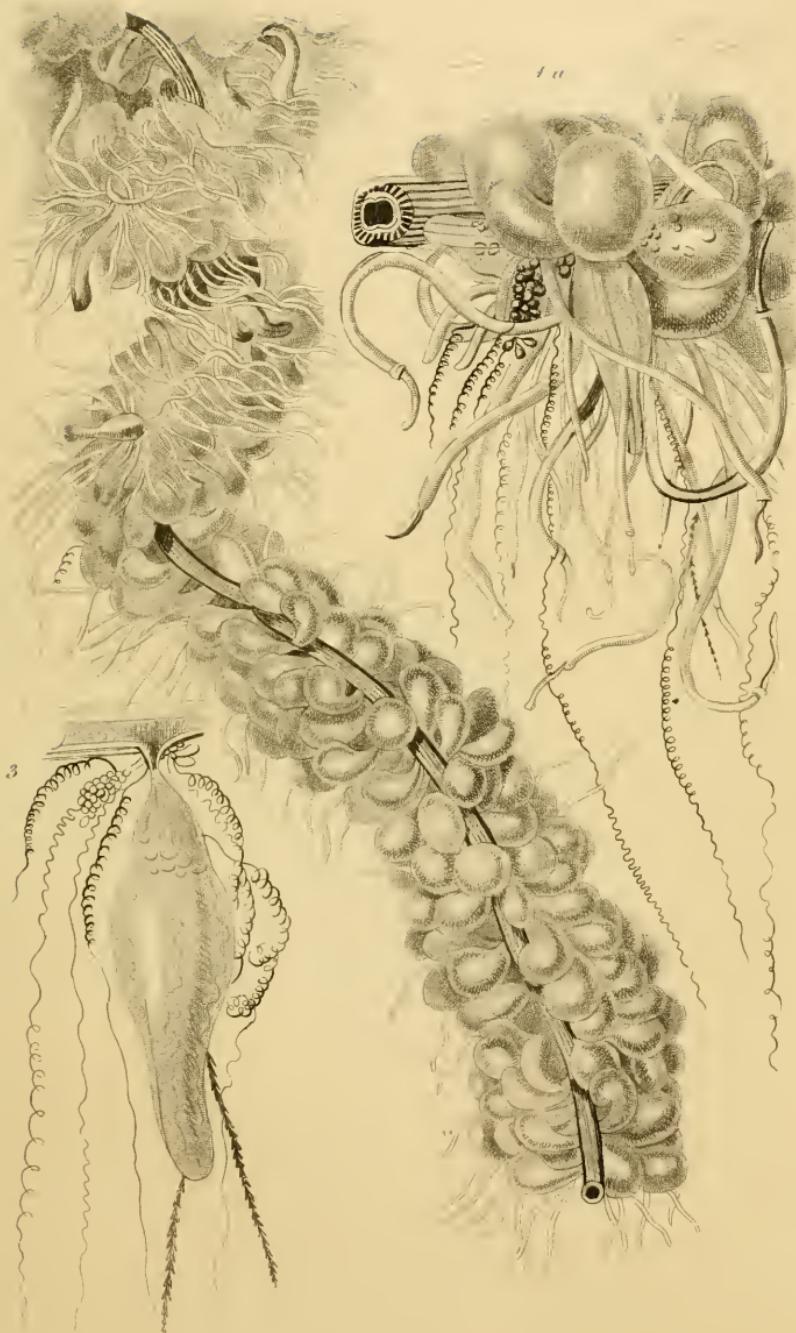
Thus, in

DIPHYES, (proper.)

The two individuals are almost similar, pyramidal, with some points round their aperture, which is at the base of the pyramid.

In CALPE, the emboxed individual has still the pyramidal form, but the other is very small and square.

In ABYLE, the emboxed one is oblong, or oval; the other a little smaller, and in the form of a bell.



1 *Stephanonita nivaria*.

1a. Part of same enlarged.

3 A separate sucker.

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In the **CUBOIDES**, it is the emboxed one which is small and bell-formed. The other is much larger and square.

In **NAVICULA**, the emboxed one is bell-formed ; the other is equally large, but shaped like a shoe.

There are also several other combinations.

FOURTH CLASS OF THE ZOOPHYTES.

THE POLYPI

HAVE been thus named, because the tentacula which surround their mouth give them some slight resemblance to the octopus, which the ancients called *polypus*. The form and number of these tentacula vary. The body is always cylindrical, or conical, often without any other viscera than its cavity, often also with a visible stomach, to which adhere intestines, or rather vessels, hollowed in the substance of the body, like those of the medusæ. In this case ovaries are also visible. The majority of these animals are susceptible of forming composite beings, by sprouting forth new individuals, like buds, nevertheless, they also propagate by eggs.

THE FIRST ORDER OF POLYPI.

POLYPI CARNOSI. (Vulgo. FIXED SEA NETTLES.)

COMPREHEND some fleshy animals, which have the habit of fixing themselves by their base, but several of which can

also crawl upon this base or detach it altogether, and swim, or suffer themselves to be carried away by the motion of the waters. They are most frequently limited to the movement of expanding more or less the aperture of the mouth, which also serves the purposes of an anus. It is surrounded with tentacula more or less numerous, and leads into a stomach which terminates in a *cul-de-sac*. Between this interior sac and the external skin, is an organization tolerably complicated, but still rather obscure, consisting chiefly of vertical and fibrous leaflets, to which the ovaries adhere, similar to threads very much contorted. The intervals of these leaflets communicate with the interior of the tentacula, and it appears that the water can enter there and come out by little orifices around the mouth ; at least the actinia sometimes ejaculates it in this way.

ACTINIA, L.

Their fleshy body, often adorned with lively colours, developing numerous tentacula, placed round the mouth, on several ranges like the petals of a double flower, has occasioned the name of *sea anemone* to be bestowed upon them. They are amazingly sensible to light, and open or close according as the day is more or less fine. When they retract their tentacula, the aperture from which these organs issue, contracts, and closes upon them like that of a purse.

Their power of reproduction is scarcely less than that of the armed polypi. They shoot forth again the parts which have been cut, and multiply by division. Their ordinary generation is viviparous. The little actiniæ pass from the ovary into the stomach and come out through the mouth. These zoophytes dilate their mouth considerably when they are hungry. They devour all sorts of animals, and especially crustacea, testacea, and small fishes, which they seize with their tentacula, and digest pretty quickly.

ACTINIA, (proper)

Are fixed by a broad and flat base. The species most common on our coasts are

Act. Senilis, L. Three inches broad, with a coriaceous, unequal, and orange-coloured envelope, and tentacula on two ranges, of a moderate length, and usually marked with a rose-coloured ring. It keeps principally in the sand, into which it instantly sinks back upon the slightest alarm.

Act. Equina, L. With a soft skin, finely striated; the colour usually of a fine purple, often spotted with green; smaller, the tentacula longer, and more numerous than the preceding. It covers all the rocks of our coasts of the channel, and ornaments them as though they bore the finest flowers.

Actinia Plumosa, Cuv. White, four inches and more in breadth; the edges of its mouth expand into lobes, all charged with innumerable small tentacula. There is an interior rank of larger ones.

Actinia Effæta. Rond. Lib. xvii. cap. xviii. Of a clear brown, striped longitudinally with whitish; of an elongated form, often more narrow towards the bottom; a smooth skin, and numerous tentacula. When it contracts itself, there often issue through the mouth some long filaments, which come from the ovaries. It attaches itself, in preference, on shells, and is extremely common in the Mediterranean.

THALASSIANTHUS, Ruppel, are actiniæ, with ramified tentacula. (*Thal. aster*. Ruppel.)

His *DISCOSOMA*, are some in which the tentacula are reduced to nearly nothing by their shortness. (*Discos. nummiforme*, Id.)

ZOANTHUS, Cuv.,

Have the same fleshy tissue, the same disposition of mouth,

and of tentacula, and an organization pretty nearly similar to that of the actiniæ. But they are united in a more or less considerable number, on a common base, sometimes in the form of a creeping stem. (*Hydra sociata*, Gm.) Sometimes in the form of a broad surface. (*Alcyonium mamillosum*, Ell.)

LUCERNARIA, Müll.

It would appear, should be approximated to the actiniæ; but their substance is softer; they fix themselves to fucus and other marine substances, by a slender pedicle; their upper part is dilated like a parasol; the mouth is in the middle. Numerous tentacula approximated in fasciculi, furnish the edges. Between the mouth and these same edges, are eight organs, in the form of cœca, which proceed from the stomach, and contain red and granulated matter.

In *Lucernaria quadricornis*, Müll., Zool., Dan. xxxi. 1—6, the edge is divided into four forked branches, each supporting two groups of tentacula. In the *L. auricula*, Ibid. clii. the eight groups are equally apportioned round an octagon edge.

SECOND ORDER OF POLYPI.

POLYPI GELATINOSI,

ARE not, like the preceding, invested with a hard envelope, neither do they produce in the interior of their structure an axis of ligneous, fleshy, or corneous substance. Their body is gelatinous, of a form more or less conical; its cavity serves as a stomach.

HYDRA, *Linn.*

Present us the animals of this class reduced to their greatest possible simplicity. A small gelatinous trumpet-shaped body, whose edges are furnished with filaments, which serve as tentacula, constitutes their whole apparent organization. The microscope enables us to discover nothing in their substance but a transparent parenchyma, filled with grains, a little more opaque. Nevertheless, they swim, they crawl, they even walk, by fixing alternately their two extremities, like the leeches, or geometrical caterpillars. They agitate their tentacula, and make use of them to seize their prey, which is visibly digested in the cavity of their body. They are sensible to light and seek after it. But the most marvellous property is that of constantly and indefinitely reproducing the parts which are taken from them, so that the individuals may be multiplied at will, by section. Their natural multiplication takes place by the young shooting forth from different parts of the body of the adult, and at first resembling branches of it.

Our dormant waters nourish five or six different species of them, which differ in colour, and the number and proportion of the tentacula.

The most celebrated, in consequence of the experiments on reproduction, to which it has first given occasion, is

Hydra viridis, Trembley, Pol. i. 1. Rœs. iii. lxxxviii. Encyc. lx. vi., which is, in fact, of a fine clear green colour. It is particularly found under the water-lentils.

Hydra fusca, Tremb. Pol. i. 3, 4. Rœs. iii. lxxxiv. Encyc. lxix., is more rare; of a grey colour; its body is not an inch long, and its arms are more than ten.

CORINE, *Gærtner*,

Have a fixed stem, terminated by an oval body, more consistent than that of the hydræ, open at the summit, and brist-

ling on all its surface, with small tentacula. Some carry their eggs at the bottom of this body. (*Tubularia coryna*, Gm. &c.)

CRISTATELLA,

Have in the mouth a double range of numerous tentacula, curved into a half-moon, forming a sort of plume of this figure, and attracting by their regular motion, the nutritive molecules. These mouths are supported upon short necks attached to a common gelatinous body, which moves like that of the hydræ. These animals are found in our dormant waters. To the naked eye they appear like small mouldy spots. (*Cristatella mucedo*, Cuv.)

VORTICELLA,

Have a fixed stem, often branched, and very much divided, each branch of which terminates by a body, in the form of a trumpet, or a bell. We behold issue from the aperture, in two opposite groups, some filaments, which maintain a continual motion, and attract the nutritive molecules. The species are numerous in our seas, and the majority too small to be well distinguished but by the microscope. They form bushes, arbuscula, plumes, and take other shapes, all very agreeable.

PEDICELLARIA

Are found between the spines of the echini, and are considered by divers authors, as organs of these animals. Nevertheless, it is more probable that they are polypi, which choose these parts as their asylum. A long slender stem terminates by a cornet, furnished at its extremity with tentacula, sometimes in the form of filaments, sometimes in that of leaves.

THIRD ORDER OF POLYPI.

POLYPIFEROUS POLYPI

Form this numerous series of species, which for a long time were regarded as marine plants, and whose individuals are, in fact, united in great numbers, to form composite animals, for the most part fixed like vegetables, whether they form a stem or simple expansions, by means of the solid supports which line them at the interior. The individual animals, more or less analogous to the actiniæ, or hydrae, are all connected together by a common body, and receive their nutriment in common; so that what is eaten by one, profits the general body, and all the other polypi. They have also a community of volition; at least, this is certain with respect to the species not fixed, such as the pennatula, which are seen to swim by the contractions of their stems, and by the continued movements of their polypi.

The name of *polyparia* has been given to the common parts of these composite animals. They are always formed by deposition, and by strata, like the ivory of the teeth; but sometimes they are at the surface, sometimes in the interior of the composite animal. These different positions have given rise to the establishment of the families of this order.

The first family,

POLYPI TUBIFERI,

Inhabit tubes, the common gelatinous body of which traverses

the axis, like the pith of a tree, and which are open either at the summit, or at the sides, to allow the polypi to pass.

Their most simple polypi appear principally to resemble the hydræ, and the cristatellæ.

TUBIPORA, L.,

Have simple tubes, of a stony substance, each containing a polypus. These tubes are parallel, and united together from space to space, by transverse laminæ, which has caused them to be compared to the tubes of an organ.

The most known species, *Tubipora musica*, L. Seb. iii. cx. 89, is of a fine red. Its polypi are green, and have the form of the hydræ. It abounds in the Indian Archipelago.

It would seem, that it is to the tubipora that we should approximate some fossil polyparia, likewise composed of simple tubes, such as the CATENIPORA, Lam., in which the tubes are arranged upon lines, intercepting empty meshes; *Tubipora catenulata*, Gm. The FAVOSITES, id. (*Corallium Gothlandicum*) composed of hexagonal tubes, crowded closely together, &c.

TUBULARIA, L.,

Have simple or branched tubes, of a corneous substance, from the extremities of which the polypi issue forth, and show themselves.

The polypi of the fresh-water tubulariæ,—PLUMATELLA, Bosc. appear very much akin to the cristatellæ, in the disposition of their tentacula.

We have some which creep over the plants of our dormant waters. (*Tubularia campanulata*, Røs.)

TUBULARIA MARINA,

Have polypi with two ranges of tentacula; the exterior one being developed in radii, the interior raised in the style of a tuft.

Our coasts produce one, *Tub. indivisa*, Lam. Ellis. Corall. xvi. c., with simple tubes, two or three inches high. Similar to blade of straw.

TIBIANA, Lamour.,

Have zig-zag tubes, which give out from each angle, a small open branch. (*Tibiana fasciculata*, Lam.)

CORNULARIA, Lam.,

Have small conical tubes, from each of which issues a polypus, with eight denticulated arms, like those of the alcyones, gorgones, &c. (*Tubularia cornucopia*.)

ANGUINARIA, Lam.,

Have small cylindrical tubes, adhering to a creeping stem, each of which is opened laterally near its extremity, for the passage of a polypus. (*Sertularia anguina*, Ellis.)

CAMPANULARIA, Lam.,

Have the ends of the branches through which the polypi pass, expanded into the form of bells.

Lamouroux distinguishes them into **CLYTIA**, which have climbing stems. (*Sertularia verticillata*, Ellis, &c.)

And into **LAOMEDEA**, which have not climbing stems, and in which the bells are smaller, and with shorter branches. (*Sert. dichotoma*, Gm., &c.)

SERTULARIA, L.,

Have a corneous stem, sometimes simple, sometimes branched, and in its sides some cells of very various forms, occupied by polypi, all attached to a gelatinous stem, which traverses the axis after the manner of the pith of a tree. These zoophytes have the appearance of little plants, equally delicate and

agreeable to view. Their propagation goes on by eggs, or gemmæ, which are developed in some cellules, larger than the others, and of different forms.

The various directions of their cellules, have given rise to their distribution into several subdivisions. Thus when the little cells are ranged on one side only over the branches, they are then the **AGLAOPHENIA** of M. Lamouroux, which M. de Lamarck names **PLUMULARIA**. (*Sert. Myriophyllum*, Gm., &c.)

When they are assembled in certain places, like the small tubes of an organ, they constitute **AMATIA**, Lamour., or **SERIALARIA**, Lam. (*Sertularia lendigera*, Ellis.)

We may distinguish from them the species in which the cellules thus disposed, surround the stem with a spiral figure.

When the cellules are placed around the stem, in horizontal rings, these are the **ANTENNULARIA**, Lam., which M. Lamouroux had named **CALLIANYRA**, and has since changed into **NEMERTESIA**. (*Sertularia antennina*, Gm. &c.)

Thus the name of **SERTULARIA** proper, remains to those species only in which the cells are on both sides of the stem, whether opposed, *Sert. abietina*, Gm., &c. or alternate. *Sertularia operculata*, Ell., &c. M. Lamouroux distinguishes the first under the name of **DYNAMENES**.

The extreme smallness of the cellules has also caused him to establish the genus **THŒA**, (*Sertularia hœlicina*, Gm. &c.)

The second family is that of

POLYPI CELLULOSI,

In which each polype is adherent in a corneous or calcareous cell with their parietes, and does not communicate with the others but by an external tunic very much attenuated, or by fine pores, which traverse the parietes of the cellules. These polypi have a general resemblance to the hydæ.

CELLULARIA, L.,

Have cellules disposed so as to form branching stems in the manner of the sertulariæ, but without any tube of communication in the axis. Their substance besides, is more calcareous.

Lamouroux distinguishes among them the

CRISIA,

Whose cellules in two ranks, usually alternate, open on the same face. (*Sertularia eburnea*, Gm., &c.)

ACAMARCHIS,

Which, with the same disposition, have a vesicle at each aperture. (*Sertularia neritina*, Gm.)

LORICULA,

In which each articulation is composed of two cells, back to back, whose opposite orifices are towards the top, which is widened. (*Sertularia loricata*, Ell.)

EUCRATIA,

In which each articulation has but a single cellule, with an oblique aperture. (*Sertularia chelata*, Gm., &c.)

We may approximate to them

ELECTRA, Lamouroux,

In which each articulation is composed of several cells, disposed like a ring. (*Flustra verticillata*, Gm.)

We should separate from them those which have cylindrical articulations, empty in the interior, and hollowed at all their surface with cellules, disposed like a quincunx. They conduct to the flustræ, and perhaps to the corallinæ. I name them **SALICORNARIA**, (*Cellularia salicornia*, Ellis, &c.)

FLUSTRA, L.,

Present a great number of cellules, united like the combs of bees, and sometimes covering divers bodies, sometimes forming leaves or stems, of which one side only is furnished with cellules in certain species, and both in others. Their substance is more or less corneous. (*Flustra foliacea*, Gm. &c. &c.)

CELLEPORA, Fabri.,

Present accumulations of little cellules, or calcareous vesicles, crowded one against the other, and each pierced with a small hole. (*Cellepora hyalina*, Gm., &c.)

TUBULIPORA, Lam.,

Are accumulations of little tubes, the entrance of which is as broad as or broader than the bottom. (*Millepora tubulosa*, Gm.)

Some bodies exist in the sea, pretty similar to polyparia, in their substance and general form, but in which no polypi have as yet been observed. Their nature is therefore doubtful; and some great naturalists, such as Pallas, and others, have considered them to be plants. Nevertheless, there are several who regard them as polyparia, with polypi, and with cells exceedingly small. If this conjecture be true, they must belong to the present order. Those among them whose interior is filled with corneous filaments present, however, some analogy with the CERATOPHYTES.

CORALLINA, L.,

Have articulated stems, supported on a sort of roots, divided into branches equally articulated, at the surface of which no pores are visible, and in which it has not been possible to perceive any polypi.

They are divided as follows :

CORALLINA proper,

Have their articulations calcareous, of an homogeneous appearance, without any perceptible bark.

The bottom of the sea is entirely covered on certain shores, with the *Corallina officinalis*, L. Ell. Corall. xxiv. a. A. b. B., the articulations of which are in a reversed oval, the small branches disposed like pinnated leaves, and themselves supporting other branches similarly disposed. It is white, reddish, or greenish. It was formerly employed in pharmacy, because of its calcareous substance.

Lamouroux again distinguishes from them, but rather slightly,

AMPHIROE.

The articulations of which are elongated. (*Corallina rigens*, Sol. et Ell., &c.)

JANIA,

Which merely have the branches more slight, and the articulations less cretaceous. (*Corallina rubens*, Ellis, &c.)

CYMOPOLIA,

In which the articulations are separated one from the other, by corneous intervals. Their surface exhibits more marked pores.

M. de Lamarck had already separated,

PENICILLUS, Lam. *Nesea* Lamouroux,

Which have a simple stem, composed internally of corneous fibres, woven together, and as it were, *felted*; encrusted with a calcareous plaster, and terminated by a bundle of articulated branches, analogous to those of the ordinary corallines. (*Corall. penicillus*, &c.)

HALYMEDE, Lamouroux,

Have stems articulated and divided like the corallines; but the substance of their articulations, which are very broad, is penetrated in the interior by corneous filaments, which are easily deprived of their calcareous crust, by acids. (*Corallina tuna*, Sol. et Ell.)

FLABELLARIA, Lamarck,

Have no distinct articulations, but form large foliaceous expansions, composed like the articulations of the halymedes, and the stem of the penicillæ, of corneous filaments, encrusted with a calcareous envelope. (*Corallina conglutinata*, Sol. et Ell., &c.)

GALAXAURA, Lamouroux,

Have stems divided by dichotomy, but their branches are hollow. (*Corall. obtusata*, Sol. et Ell., &c.)

LIAGORA, Id.,

Have hollow stems, divided by dichotomy, but without articulations. (*Corall. marginata*, Sol. et Ell., &c.)

It is, perhaps, at the end of the corallines that we should place

ANADIOMENE, Lamouroux,

Vulgarly known under the name of *Corsican moss*, and so usefully employed as a vermifuge. It is composed of articulations regularly disposed in branches, of a substance a little corneous, covered with a gelatinous coat. (*Anadiomene flabellata*, Lamour.)

Among those productions without apparent polypi, which by conjecture are referred to the polyparia, there are few more singular than

ACETABULUM, Lam.

A slender and hollow stem, supports a round and thin plate, like a parasol, striated in radii, crenulated at the edge, and having at the centre a small smooth disk surrounded with pores. No polypi are perceptible in it. The radii of its disk are hollow, and contain greenish grains, which has caused it to be regarded as a plant by Carolini.

There is one of them in the Mediterranean. (*Tubularia acetabulum*, Gm. Donat. Adri. iii. Tournef. Inst. ccxxviii.)

POLYPHYSA, Lam.,

Have, like the preceding, a slender and hollow stem, but which supports at its summit, a packet of small closed vesicles, instead of a disk formed of tubes. (*Pol. aspergillum*, Lamour.)

The third family,

POLYPI corticati,

Comprehends the genera in which the polypi are all attached by a common, thick, fleshy, or gelatinous substance, in the cavities of which they are received and which envelopes an axis of variable form and substance. The polypi of those which have been observed, are a little more complex than the preceding, and approach more to the actiniæ. In their interior a stomach is distinguishable, from which proceed eight intestines, two of which are prolonged into the common mass, and the others terminating sooner, appear to fill the place of ovaries.

They are subdivided into four tribes.

The first is that of

CERATOPHYTA,

In which the interior axis has the appearance of wood or horn, and is fixed. Two genera are known, both very numerous.

ANTIPATHES, Lin. Vulgò. *Black coral,*

Have the substance of their axis branched, and of a ligneous appearance, enveloped in a bark so soft, that it is destroyed after death. Accordingly, in cabinets they resemble branches of dry wood. (*Ant. spiralis*, Sol. et Ell.)

GORGONIA, L.,

Have, on the contrary, this ligneous or corneous substance of their axis, enveloped in a bark, the flesh of which is so penetrated with calcareous grains, that it dries up on the axis, and often preserves its colours in a state of great beauty and vivacity. It is dissoluble in acids. The polypi of several species have been observed. They have each eight denticulated arms, a stomach, &c. like those of the coral, and the alcyone. (*Gorgonia pinnata*, Gm., &c.)

M. Lamouroux distinguishes from these,

PLEXAURUS,

Whose thick bark, with cellules not projecting, makes but little effervescence in acids. (*G. Crassa*, Gm., &c.)

EUNICEA,

Whose bark, organised like that of Plexaurus, has projecting nipples, from which its polypi issue forth. (*Gorgonia antipathes*, Seba, &c.)

MURICEA,

Whose bark, moderately thick, has projecting nipples, covered with imbricated and bristling scales. (*M. spicifera*, Lam.)

PRIMNOA,

Whose elongated nipples are imbricated, hanging one upon the other. (*Gorg. Reseda*, Gm., &c.)

The second tribe,

LITHOPHYTA,

Has the interior axis of a stony substance and fixed.

ISIS, *L.*,

Have the axis branched, and without impressions or cellules, hollowed at its surface. The animal bark which envelopes it, is mixed with calcareous grains, as in *Gorgonia*.

CORALIUM, *Lam.*,

Has its axis without articulations, and only striated at its surface.

It is to this subgenus that belongs

The coral of commerce. *Isis nobilis*, L. Esp. i. vii., celebrated for the fine red colour of its stony axis, and the fine polish of which it is susceptible, which renders it particularly adapted for the composition of various trinkets. Its fishery is very productive in several parts of the Mediterranean. Its bark is cretaceous and reddish. Its polypi, as in many other genera, have eight denticulated arms.

MELITE, *Lam.*,

Have the stony substance of their axis interrupted by inflated knots, of a substance similar to cork. (*Isis ocracea*, Espern.)

ISIS, properly so called. *Lam.*,

Have it interrupted by strangulations, the substance of which resembles horn. Their bark, thick and soft, falls more easily than in the preceding. (*Isis hippuris*, L., &c.)

M. Lamouroux yet distinguishes from the Isis, properly so called,

MOPSEA,

The bark of which is thinner, and more adherent. (*Isis dichotoma*, Seba, &c.)

MADREPORA, *Lin.*,

Have their stony part sometimes branched, sometimes in rounded masses, or in extended laminæ, or in leaflets; but always furnished with lamellæ, which are united concentrically in points where they represent stars, or which end at lines, more or less serpentine. In the living state, this stony part is covered with a living bark, soft and gelatinous, and bristling with rosettes of tentacula, which are the polypi, or rather the actiniæ, for they have generally several circles of tentacula, and the stony laminæ of the stars correspond, in some respects, to the membranaceous laminæ of the body of the actiniæ. The bark and the polypi contract upon the slightest touch.

The varieties of their general form, and of the figures which result from the combination of their lamellæ, have given rise to several subdivisions, many of which, however, enter one into the other. They cannot be definitively established, until the relations of the polypi, with these dispositions, shall be known.

When there is but a single circular star, or in an elongated line, with very numerous laminæ, these are the FUNGIA, Lamarck. *Mad. fungites*, L. Their animal truly represents a single actinia, with large and numerous tentacula, and whose mouth corresponds to the sunken part, where all the laminæ end.

We find among the fossils, stony polyparia, with a single star, which appear to have been free from all adherence. These are TURBINOLIA, Lamarck, *Madr. turbinata*, L. CY-

CLOLITHES, *Mad. porpita*, Linn., and TURBINOLOPSSES, Lamour. *Turbin. ocracea*, Lamour.

When the madrepore is branched, and there are no stars, but at the end of each branch, it is a CARYOPHYLLIA, Lam. The branches are striated; at each star is a mouth surrounded with many tentacula. (*Madr. cyathus*, Sol. et Ell., &c.)

OCULINA, Lam.,

Have small lateral branches, very short, which gives them the appearance of having stars along the branches, as at the end. (*Madr. virginea*, L., &c.)

MADREPORA (properly so called) Lam.,

Have all their surface bristling with little stars, with salient edges.

His POCILLOPORA have in the surface small sunken stars, and pores in the internals. (*Madr. damicornis*, Esper.)

In SERIALOPORA, the little stars are ranged in lineal series. (*Madr. seriata*, Pall.)

ASTREA,

Have a broad surface, most frequently convex, hollowed with crowded stars, each of which has a polype furnished with numerous arms; but on a single range, at the centre of which is the mouth. (*Madr. radiata*, Sol. et Ell., &c.)

When the surface is plane, or in broad laminæ, sown with stars on one side only, the animals are named EXPLANARIA. (*Madr. cinerascens*, Sol. et Ell.)

The PORITES are in some sort ramous astreæ. (*Madr. porites*, Sol. et Ell.)

When this surface is hollowed with elongated lines, as it were with valleys, separated by hillocks, furrowed cross-wise, the animals are MEANDRINA, Lam.

In each valley, from space to space, open some mouths, and the tentacula, instead of forming rosettes around these mouths, form a range along the sides of each valley. Some species have none at all, but the margin of each mouth is merely festooned. (*Madr. labyrinthica*, Sol. et Ell., &c.)

If the hillocks which separate these vales, are raised in leaflets, or crests furrowed on both sides, the species are PAVONIA. There are mouths in the bottom of the valleys, and usually without tentacula. (*Madr. agaricites*.)

When these hillocks are elevated in cones, as if they were salient stars, M. Fischer names them HYDNOPOHORA, M. Lamarck, MONTICULARIA. They should be distinguished according as their polypi are at the summit of the salient part, as in the oculinæ, or in the bottom of the concave parts, as in the meandrinæ. (*Madr. exesa.*, Sol. et Ell.)

AGARICINA,

Are composed of laminæ, hollowed on one side only, by valleys which are themselves furrowed. (*Madr. cucullata*, Sol. et Ell.)

It has been thought that we might approximate to the madreporæ in general, certain polypariæ; SARCIJNULA, Lam., formed of cylinders, whose section forms a star, in consequence of the projecting lamina, which traverse the interior, *Madr. organum*, Lin.; when there is a solid axis in the middle of the laminæ, these are STYLINÆ. These polypariæ may also, perhaps, be related to the tubipora.

MILLEPORA, L.,

Have their stony part of very various forms, and its surface only hollowed with small holes, or pores, or even without any apparent holes.

M. Lamarck distinguishes

DISTICHOPORA,

In which the pores, more marked, are ranged on both sides of the branches. (*Millepora violacea*, Pall.)

Among those in which the pores are equally divided, we distinguish

MILLEPORA, (proper) Lam.,

Solid, diversely branched. (*Mill. alcicornis*, Pall.)

When their pores are not apparent, as sometimes happens, they are named **NULLIPORA**. (*Millepora informis*, L., &c.)

ESCHARA, Lam.,

Which have expansions flattened like leaflets. (*Millepora foliacea*, Ell., &c.)

RETEPORA, Id.,

Which are escharæ, pierced with meshes. (*Millepora celulosa*, Ell.)

ADEONA, Lamouroux,

Which are escharæ supported on an articulated stem. There are some entire, and some pierced with meshes. (*Ad. grisea*, Lamour.)

The third tribe,

POLYPARIA NANTIA,

Whose axis is stony, but not fixed.

PENNATULA, L.,

Have the body common, free from all adherence, of a regular and constant form, and able to move by the contractions of its fleshy part, and also by the combined action of its polypi. This body is fleshy, susceptible of being contracted, or dilated,

in its divers parts, by means of fibrous layers which enter into its composition. Its axis encloses a simple stony stem. The polypi have generally eight denticulated arms. Most of the species shed a lively phosphoric light.

Whatever may be the general form of the pennatulæ, they have always one of their extremities without polypi. This has been compared to the tubular part of the feathers of birds.

PENNATULA, (properly so called) *Cuv.*,

Which, having given their name to the whole genus, have themselves derived it from their resemblance to a quill. The part without polypi is cylindrical and terminated in a blunt point. The other part is furnished on each side with wings, or barbs, more or less long, and broad, supported by spines, or stiff setæ, which spring from their interior, and bristle one of their edges, without, however, being articulated with the petrous stem of the axis. It is from the centre of these barbs that the polypi issue forth.

The Ocean and the Mediterranean both produce

Pennat. rubra, et *Penn. phosphorea*, Gm., Albinus Annot. Acad. i. vi. 3—4. Which has the stem between the barbs very rough behind, except on a line which traverses its length.

We find more particularly in the Mediterranean,

Pennatula grisea, Gm., Albinus, Annot. Acad. 1, 2. larger, with broader barbs, more spiny, and a smooth stem.

VIRGULARIA, *Lam.*,

Differ from the pennatulæ, only because their wings, much shorter in proportion to their total length, are deprived of spines. (*Pennatula mirabilis*, Müll., Zool., Dan. xi., very different from the true *Pen. mirabilis* of Linnaeus.)

These wings sometimes represent only simple transverse ranges of tubercles. (*Pennat. juncea*, Pall. et Gm.)

SCIRPEARIA, Cuv.,

Have the body very long and very slender, and the polypi isolated, ranged alternately along both sides. (*Pennatula mirabilis*, Linnæus.)

PAVONARIA, Cuv.,

Have also the body elongated and slender, but have polypi only on one side, and they are crowded there in the shape of a quincunx. (*Pennat. antennina*, Bohatsch.)

RENILLA, Lam.,

Have the body short, and instead of the part, which in the proper *pennatula* is furnished with barbs, a broad kidney-formed disk, supporting the polypi on one of its faces. (*Pen. reniformis*, Ellis.)

VERETILLUM, Cuv.,

Have a cylindrical body, simple, and without branches, furnished with polypi in a part of its length. Their bone is usually small, and the polypi large. We can trace more easily than in any other composite zoophyte, the prolongations of their intestine in the common stem.

We have one in the Mediterranean, *pennatula cynomorium*, Pall., Misc., Zool. xiii. 1—4; *alcyonium epipetrum*, Gm., Rap. Ac. Nat. Cuv. xiv. p. 2. xxxviii. 1. Often more than a foot in length, thicker than one's thumb, remarkable for the brilliancy of the light which it sheds. Finally,

OMBELLULARIA, Cuv.,

Have a very long stem, supported by a bone of the same length, and terminated at the summit only by a branch of polypi. (*Pennatula encrinus*, Ellis.)

We find in the sea, and among the fossils, some small

petrous bodies pierced with pores, which have been thought to approximate to the millepora. If they were, in fact, enveloped with a bark, containing polypi, they would be moveable polyparia, and should rather be approximated to the pennatulæ. Such are

The OVLITES, *Lin.*, in the form of eggs, hollow internally, and often pierced at both ends; the LUNULITES, orbicular, convex, striated, porous on one side, and concave on the other; the ORBULITES, orbicular, flat, or concave, porous on both sides, or at the edges. If the DACTYLOPORA is free, as M. de Lamarck thinks, it would also appertain to this division. It is a hollow ovoid, open at both ends, with two envelopes, both pierced with meshes, like the retepora.

In the fourth tribe, the animal bark encloses only a fleshy substance, without either osseous or corneous axis.

ALCYONIUM, *Linn.*,

Have, like the pennatulæ, polypi, with eight denticulated arms, and intestines stretching into the common mass of the ovaries; but this mass is not sustained by an osseous axis. It is always fixed to the body, and when it is elevated into trunks or branches, we find nothing in its interior but a gelatinous substance, traversed by several canals, surrounded by fibrous membranes. The bark is harder, and hollowed with cellules, into which the polypi retire more or less completely.

We have in abundance in our seas the

Alcyonium digitatum, Ell., Coral. xxxii., which is divided into thick, short branches; *Alc. exos.*, which has more slender branches of a fine red, &c.

Linnaeus, and his successors, have united, on rather slender grounds, to the alcyonia, divers marine bodies of various tissue, but always without visible polypi. Such are

THETHYA, Lam.

The interior of which is altogether bristled with long siliceous spirals, which are united on a central nucleus equally siliceous. Their crust presents, as in the sponges, two orders of holes ; the one closed by a sort of trellis-work, must be for the entrance of water ; the other, gaping, destined for its exit.

We also place at the sequel of the Alcyonia,

SPONGIA, L.

The sponges are marine fibrous bodies, which exhibit nothing perceptibly, but a sort of thin, fine, gelatine, which dries up, and scarcely leaves any trace, and in which, as yet, no polypi, or any other moveable part, have been observed. It has been said that the living sponges undergo a sort of tremor, or contraction, when they are touched ; that the pores with which their superficies is pierced, palpitate in some degree ; but the existence of such movements has been contested by Mr. Grant, and other writers.

The sponges assume innumerable forms, each according to its species, as those of shrubs, trumpets, vases, tubes, globes, fans.

Every one is acquainted with the *common sponge*, *spongia officinalis*, which is found in great brown masses, formed of very fine fibres, flexible, elastic, and pierced with a great number of pores, and small irregular conduits opening one into the other.

FIFTH AND LAST CLASS OF THE ZOOPHYTES,
AND OF THE ENTIRE ANIMAL KINGDOM.

INFUSORIA.

IT is customary to place at the end of the animal kingdom, some beings so small that they escape the naked eye, and which remained undistinguished, until the microscope had, in some sort, revealed to us another world. The majority of them present a gelatinous body of the most extreme simplicity, and this, undoubtedly, is their proper place; but there have also been left among the infusoria, some animals much more complicated in appearance, and which resemble them only in their minuteness, and the habitat in which they are usually found.

Of these we shall make our first order, still, however, insisting on the doubts which yet remain relative to their organization.

FIRST ORDER OF INFUSORIA.

ROTIFERA,

Are distinguished, as we have just said, by a greater degree of complication. Their body is oval and gelatinous. A

mouth, a stomach, an intestine, and an anus near the mouth, are distinguishable. Behind, the body is most frequently terminated by a *tail*, variously constructed, and in front it supports a singular organ, diversely lobated, with denticulated edges, the denticulations of which execute a successive vibration, which might cause the belief that this organ consisted in one or several denticulated and revolving wheels. One or two prominences on the neck, have even appeared to some observers to support eyes. This revolving organ does not serve to conduct the aliments towards the mouth; it might be suspected that it has some relations with respiration.

FURCULARIA, Lam.,

Have the body without armature, the tail composed of articulations, which enter one into the other, and terminate by two filaments.

It is upon one of them, the *Furcularia*, or *Rotifère des toits*, that Spallanzani has made his famous experiments, as to their resurrection. Covered with dust in the gutters, it dries up, but yet, after several weeks will resume life and motion, if it be moistened with a little water.

TRICHOCERCA, Lam.,

Do not appear to me to differ from the Furculariæ, but in a little less development of their vibratile organs. (*Trichoda paxillum*, Müll., &c.)

VAGINICOLA, Lam.,

Appear to be only trichocercæ, enveloped in a transparent case; but in this instance, there is reason to fear, that some optical illusion has taken place. (*Trich. innata*. Müll.)

TUBICOLARIA, Lam.,

Do not differ from the furculariæ, except that they live in

small tubes, which they construct with foreign molecules, but which make no part of their body, like those of the polyparia. Their rotatory organ, nevertheless, appears out of the tube, pretty nearly after the manner of the head of the polypi.

We have one common enough on the conservæ of our marshes. *Vorticella tetrapetala*, Blumenb., Dutrochet. Ann. Mus. xix. xviii. 1—10, whose rotatory organ is divided into four lobes.

BRACHIONUS, *Müll.*,

With rotatory organs, and a tail pretty nearly similar to those of the furculariæ, carry a sort of membranous, or scaly buckler, which covers their back, like that of certain monoculi.

SECOND ORDER.

INFUSORIA HOMOGENEA,

Whose body exhibits neither viscera, nor other complications, and often does not even present any appearance of a mouth.

The first tribe

Comprehends those which, with a gelatinous body, more or less contractile in its various parts, still presents as external organs, some ciliæ more or less strong.

They are named URCEOLARIA, *Lam.*, when they have the form of a trumpet, from which the ciliæ issue, as in the polypi called *Vorticellæ*; TRICHODÆ, when with a flat body, these ciliæ are at one extremity; LEUCOPHRA, when they sur-

round the whole body; KERONA, when there are some large ones, representing a sort of horns; HIMANTOPUS, when these pretended horns are elongated into a kind of filament.

The second tribe

Presents those which have no visible external organs, unless we consider a tail as such.

CERCARIA, Müll.,

Have, in fact, their oval body terminated by a filament. To this genus belong, among others, the animalculæ, which are observed in the semen of different animals, and on which so many fantastic hypotheses have been founded.

When this filament is forked, as sometimes happens, M. de Lamarck names these animals TURCOCERCA.

VIBRIO, Müll.,

Have the body slender, and round, like the little end of a thread.

It is to this genus that belong the pretended eels in glue and vinegar. *Vib. glutinis et aceti*. These last often distinguishable by the naked eye. It is asserted that they change skin, that they have sexes, produce living young in summer, and eggs in autumn. The frost does not destroy them. The first appear in the glue or paste of diluted flour.

ENCHELIS, Müll.,

Have the body oblong, softer, less defined than that of vibrio.

CYCLIDIUM have it flat and oval; PARAMECIUM, flat and oblong; KOLPODA, flat and sinuous; GONIUM, flat and angular; BURSARIA, hollow like a sac.

The most singular of all are

PROTEUS, L.

No determined form can be assigned to them; their figure

changes every moment, and successively assumes all kinds of limits, sometimes rounded, and compact, sometimes divided and subdivided into strips in the most fantastic manner. (*Proteus diffluens*, Rösel.)

MONAS, *Müll.*,

Resemble, in the microscope, little horns, which move with great quickness, although without any apparent organ of motion.

VOLVOX,

Have a small globular body revolving on itself, and often enclosing smaller globules, which, doubtless, serve to propagate the race.

SUPPLEMENT
ON THE
FOURTH AND LAST GRAND DIVISION
OF
A N I M A L S.

THE ZOOPHYTES.

UNDER this complex denomination, which signifies *animal plants*, we comprehend those animals, which, not being symmetrical, are not capable of being divided into two similar sides, situated at the right and left of a secant plane, or imaginary line, which should pass through the length of the animal, all the parts of which might be referred to this plane. But, on the contrary, in the animals in question, the parts are disposed, in a manner more or less regular, round a common point, taken as a centre, or the axis of the body. This has caused them sometimes to be compared to flowers, of which all the parts have also this disposition. From this, Pallas has derived the denomination of *centrina*, which he has given to one division of these animals, which has been changed to *radiata*, radiated animals, and *actinozoaria*, by some writers.

This last type of the animal kingdom, we do not find designated under a collective name, except by the ancient and the most modern zoologists.

Thus Aristotle, who appears, nevertheless, to have known some species of the principal classes which constitute it, has never employed the word zoophytes as a collective name or otherwise, although, in relation to the sponges, he has said, that they partake more of plants than of animals, and that it may be doubted whether they are animals or vegetables. But the compound word zoophytes, is not to be found in his works, though some authors have erroneously attributed it to him.

It does not appear that he was acquainted with the animals which are designated at present under the name of *holothuria*. He certainly employs this denomination, the etymology of which is unknown; but he applies it to beings which have not the faculty of locomotion, though they are not attached anywhere, which leads us to presume, that by this word he indicated the actiniæ, which, nevertheless, were designated by him under the name of *acalephos*, and which, in fact, he classes among the animals which partake at once of the animal and plant.

Aristotle, on the contrary, was perfectly well acquainted with the echini and the asteriæ, which he designates, the first under the name of sea-urchins, the second, under that of sea-stars. But he has made them animals of his division of testacea; an approximation which we shall find to have been admitted, even to the end of the last century. He distinguishes several species very well, such as *spatangus brissus*, the sea urchins proper, and a smaller species. But still it does not seem that his distinction is established on characters sufficient to enable us to recognize at the present day, in any very certain manner, the animals of which he intended to speak.

As for the asteriæ or sea-stars, which in one passage he enumerates among the equivocal beings between the animal and plant, while in another he ranges them with the testacea, the little that he says is very incomplete, and not very easily to be understood.

The medusæ also appear to have been known to Aristotle, but he confounded them with the actiniæ, properly so called, under the common denomination of sea-nettles, *acalephe* and *knide*, which signify nettle. These, again, are beings whose nature is equivocal between the plant and the animal. In fact, he tells us, it is the property of an animal to move itself, to direct itself towards its food, to feel what it encounters, and to use in its defence the firm and hard parts of its body. But to have an organization extremely simple, to attach itself with facility to rocks, and to have a mouth, but no apparent orifice for the issue of the excrements; all this is more of the nature of the plant. In other places of his works, Aristotle enters into some details of organization and manners, respecting his acalephai. Among other matters, he tells us that there are some which remain fixed upon rocks, and other submerged bodies, and others which are detached from them; an observation which has led several authors to think that he was speaking of actiniæ and medusæ; but this opinion is not free from doubt.

Of all the rest of the animals which constitute the zoophytes of modern zoologists, it does not appear that Aristotle was acquainted with any except the sponges, respecting which he gives us some details of tolerable extent.

As to the animals which he calls *polypi*, it is well known, that they are not the same as those so called in the present day. We have already seen in our observations on the mol-lusca, that they are the octopi, respecting which he has left us some valuable remarks.

It is not certain whether his *Pneumon* be a medusa, as some authors assure us, and not a testaceum. As to his tethys, it is evident that they are our ascidiæ.

Pliny, as might be well imagined, has not added much to what Aristotle has said, concerning the zoophytes. He has confined himself to translating the Greek names of urchins, sea-stars, nettles, and sponges, by those of *echini*, *stellæ marinæ*, *urticæ marinæ*, and *spongiae*, without adding any thing to the little said by Aristotle. Neither has he, any more than the Greek philosopher, made use of the term zoophytes, though he has most certainly declared that these beings were neither plants nor animals, but something of an intermediate nature.

Nor has Ælian employed this denomination of zoophytes, or animal plants; and if we do find in different parts of his collection, the names of urchins, sea-stars, marine lungs, it is only in relation to some peculiarities, altogether insignificant, and even completely erroneous.

Oppian, in his poem on fishing, has introduced nothing more respecting these animals, than the authors which preceded him.

Sextus Empiricus appears to have really been the author who first employed the term zoophytes; but it does not seem that he did so for the purpose of indicating the beings which Aristotle regarded as intermediate between animals and vegetables. He tells us that they are beings which are found in the roads, and are produced by fire.

Isidore de Seville, and much later, Albertus Magnus, employed this expression for the true zoophytes; but these writers have added nothing to the observations of the ancients on the natural history of the animals. The first translators of Aristotle, Budæus, and Theodore Gaza, also employed it, and since their time, it has been generally adopted.

Wotton, in the very remarkable work which he published upon animals, also employs the same word for the same beings. In fact, his zoophytes comprehend the tethys, the holothuriæ, the star-fish, the sea-lungs, the sea-nettles, and the sponges. In the same author the expression *purgamenta maris*, is to be found for a division of beings, with the relations of which he was not acquainted.

From that period, all the naturalists, at the revival of letters, employed the classic denomination of zoophytes; but there was always some uncertainty in the application which they made of the names left by the ancients, to the objects which they had under their immediate eye. Moreover, they ranged among the zoophytes, animals of classes altogether different, which they designated by names derived from some rude resemblance with terrestrial beings. Thus Belon placed there the anatifæ, or pollicipes, with the sponges ; the holothuriæ, and the tethys, which he appears to have known very little, and confounded together, although his tethys is evidently an ascidia. On the contrary, he ranged the sea-nettles, a denomination which he reserved for the actiniæ, among the mollusca, in the same manner as he treated of the urchins, and sea-stars, among the testacea, specifying them, however, in a tolerably complete manner.

Rondelet, a short time after, in adopting the same divisions, made pretty nearly the same confusion; but he began to make known, not only some new species, but some animals of genera altogether new. He applied, in a definite manner, the denomination of holothuria, to the animals which we know at the present day under this name. Nevertheless, he placed one species among the sea-nettles, and on the other hand, referred to holothuria, a species of firola. He clearly distinguished the tethyes, which are the ascidæ of the present day ; and he applied, in a definitive manner, the name of free sea-nettles to the medusæ, and that of fixed sea-nettles to

the actiniæ, supporting this distinction by recognizable figures.

These different improvements were inserted in his great Dictionary, by Conrad Gesner, published for the first time in 1604. In fact, he gave a synoptic table of the species of sea-nettles, divided as Rondelet had divided them. The urchins and sea-stars are united among the testacea; but the escharæ and pinnatulæ constitute the marine zoophytes. Some other species were also indicated, and figured by this author. He likewise perfectly perceived the order of the gradation of organization in this last division from the sponges which approximate the closest to the plants, up to the conchs which are preceded by the univalve shells.

Aldrovandus exhibits, perhaps, better than Gesner, the state of zoophytology, because his compilation is methodical. In that work, we find these beings forming the last division of the whole animal kingdom, and composed of the actinia, under the name of fixed sea-nettles; of the medusæ, under that of free sea-nettles; of the alcyones, under that of marine lungs, and *malum granatum*; of the holothuriæ; of the ascidliæ (named tethyes); of the pinnatulæ (*pinnæ marinæ*); of the lobulariæ, under the name of *manus marinæ*, and probably of the encrusting species.

The echini are definitively placed among the testacea; but by a very remarkable singularity, the asteriæ are placed at the end of the division of the insects. There is no division for the *purgamenta maris*.

Here terminates the first part of the history of this science, in which we find the denomination of zoophyte generally adopted, with the notion that the beings ranged in this division, were intermediate between animals and vegetables; but still it contained as yet but the smallest number of the beings which modern zoologists have subsequently referred to it.

Towards the middle of the age in which the work of Aldrovandus had made known the state of natural history in general, appeared one of the most interesting works respecting the natural history of the zoophytes, a work which commences the long series of those for which we are indebted to the naturalists of Italy on the same subject. This was the Natural History of Ferrante Imperato, of Naples. Besides a number of observations on the living animals which have been since ranged among the zoophytes, (some, perhaps, erroneously) we find there, on the corals, the madre pores, the tubipores, &c., the bases of the opinion generally adopted as to the truly animal nature of these organized bodies; but before the truth of this opinion had been recognized, they were successively placed in the other two kingdoms.

The ancients, who had a very imperfect knowledge of corals—the genius of Aristotle having left them nothing on the subject—determined, after the mere consideration of the external form, to make vegetables of them, from whence the names of *lithophyton* and *lithodendron*, under which they were known for a long time after Dioscorides. Before him, we find them designated by the denominations of *coralium*, *curalium*, and, finally, of *corallium*, (the etymology of which is uncertain), in Theophrastus, Pliny, and Ovid.

At the revival of learning, the numerous commentators on Dioscorides went little farther than himself. It therefore appears that Imperato was the first who had a glimpse of the gradual passage from the corals to the tubulariæ, and to the madre pores, and who recognized in these last, the animal character grow more and more pronounced, to such a degree that he compares them to the veellæ. It is also in this original author, that we find for the first time, the terms pore, madre pore, millepore, retepore, tubipore, as well as those of fungite, astreolite, porpite, &c., which have since been applied to those determinate forms, which we call genera. We also

find in him the denominations of alcyone, (already employed by Dioscorides), of coralline, of sertulariæ, and many others, which have been adopted as designatory of genera by modern zoologists.

These germs remained, however, for a long time buried, insomuch, that these organized bodies, whose existence Imperato had marked by good figures, and by particular denominations, were regarded during the whole course of the 17th century, as appertaining to the mineral kingdom, by some writers, or to the vegetable by others. Nevertheless, these different authors, (deceived as they were respecting the nature of corals, which they divided into lithophytes and keralophytes, according as their solid part, the only part which was known, was calcareous or corneous), did not the less augment the number of species, and divide them into genera, which they endeavoured to characterize in a more precise manner. Thus it was that the corallines, and sertulariæ, which they placed among the mosses, the escharæ, the alcyones, and even the pinnatulæ, of which they made fuci, were successively and very clearly established into distinct genera.

From this time, we remark, however, many authors already who, like Boccone and Lluid, suspected the animal nature of some of these productions. Thus the former, although he would have it that the coral was a stone, and not a plant, maintained, erroneously, perhaps, that the *alcyonium asbestinum* was a hive of animals, and the latter was of opinion that the *tubularia indivisa* should be regarded as a zoophyte.

These different facts coincided with the point of time at which the classification of plants began to take as its bases, the character furnished by the flowers. It was natural, therefore, that Marsigli, probably awakened to the subject by the apothecaries of Marseilles, who considered some flowers as coral, described as such the polypi, which he had observed in

the alecyone palmata, in the true coral, and in the antipathes. Thus the opinion of the botanists, who claimed all the corals, all the polyparia, as belonging to the vegetable kingdom, appeared to be confirmed, and the true nature of these beings was still unknown for some time, although some chemists had made the observation that the principles which entered into their composition were much more animal than vegetable, and Marsigli himself had remarked that the flowers of the coral disappeared, when it was put into fresh water, or withdrawn from the water altogether. Accordingly, the moment was at hand when they should definitively pass into the kingdom to which they really belong, although, even in 1700, Tournefort published a memoir to distinguish marine from maritime plants, and in which he employs the manner in which he supposes the madrepores to grow, to establish his opinion on the germination and vegetation of stones. Reaumur himself, in 1727, published a memoir to explain how stony bodies can vegetate, by supposing, that in the coral, for example, it was the bark alone which vegetated, and which formed a stem, by depositing the red grains with which it is filled. Rumph, who had occasion to examine a great number of living corals in the Indian Archipelago, where they are spread in profusion, having established a particular division for the zoophytes, was perhaps the first who demonstrated the animal nature of these pretended plants, in many species. But it was only in 1727, that Reaumur reported to the Academy of Sciences, the celebrated discovery made by Peysonnel, in the Mediterranean, of the animality of the lithophytes, proving that what Marsigli had described and figured as the flowers of coral, were real aggregated animals, altogether analogous to the actiniæ, and by no means what he had himself described as the flowers of marine plants in the memoir just mentioned, and before; consequently, that we must regard the madrepores, millepores, and in general all

the lithophytes, or aggregated testæ, as the habitations of these animals.

This important discovery, to which Peysonnel was undoubtedly conducted by the observations of Marsigli, was not, however, immediately adopted; and Reaumur himself, in the memoir in which he reported it, endeavoured to contest its evidence, and was even afraid to name its author. But he was obliged to admit it, when Trembley, in a letter addressed to him in the month of December, 1740, had published all the singularities of the natural history of a little animal, known in the fresh waters of Europe, and which, already signalized by an anonymous writer, in the transactions of our own Royal Society, had been forgotten for more than ten years. We find, in fact, in the fresh water polypus, named *hydra* by Linnæus, the naked type of the coral animals.

Shaw, the traveller, in his Voyage to Barbary, vainly proposed to regard as simple nutritive radicles, the undulating filaments which he saw come forth from the stelliform impressions of the *madrepora ramea*, and from some other aggregated living madrepores. The discovery of Peysonnel acquired all the corroboration which it deserved, especially from the coasting voyages of Jussieu. These voyages were undertaken, one in the Channel, and the other in the Atlantic, for the express purpose of verifying and extending this discovery, by applying it to a greater number of beings, which was done for the tubulariæ and other genera. The name of polypus appears to have been first employed by Bernard de Jussieu, to designate the little animals, which, inhabiting pretended marine plants, are provided on the head or body with horns, (*tentacula*) which serve them as hands or feet, to take their aliment or to walk.

Reaumur, from this time thoroughly convinced, fully adopted the views of Peysonnel, thus confirmed by Jussieu and Guettard. He created the name of *polypier* (*polyparium*) since

generally adopted, perhaps without sufficient discrimination, to express the solid part, of whatsoever nature it might be, on which those little animals live, to which, with Jussieu, he gave the general denomination of *polypi*. This name he had given to those discovered by Trembley, because their tentacula or horns appeared to him to be analogous to the arms of the sea-animal which the ancients had named *polypous*. Thus definitively returned into the animal kingdom an entire and an extremely numerous class of beings, which from the intimate nature of their union, had been so long considered as vegetables, and which, considered in part, had been recognized as animals approximating to the actiniæ, and consequently entering into the grand division of the zoophytes.

Notwithstanding all these circumstances which we have now detailed, and more which it might prove tedious to enumerate, Linnæus, who in the first editions of the *Systema Naturæ*, had imitated Ray, in placing the lithophytes, in the vegetable kingdom, still preserved some doubts. In a dissertation on the corals of the Baltic, after enumerating successively the objections to the opinions of those who have maintained that these bodies were minerals, vegetables, or animals, he professes that he considers it a difficult matter which opinion to choose. Some time after, however, he was convinced of the truth, and in the sixth edition of his immortal work, admitted them into the animal kingdom.

Thus at this second period of the science, the zoophytes were definitively ranged in the animal kingdom, by systematic writers. But they were still very far from being grouped and united in a suitable manner, as we shall see in our examination of the particular researches of some writers on the subject.

One of the first works which tended to bring this science to perfection, was published by Vitali Donati, on the Adriatic

Sea, in which he has described the animals of a considerable number of polyparia, already figured by Imperato.

It was also at the same period, that the more or less flexible polyparia, known under the names of *Sertulariæ*, &c. were much better distributed, owing to the remarkable labours of Ellis upon the corallines—labours which have served as the basis of every thing valuable which has been subsequently performed respecting the genera of these animals. This writer, however, has not been eminently happy in the methodical distribution of the numerous species which he has examined. He has united almost all of them under the common denomination of corallines, as Ray had done, who regarded them as plants.

Notwithstanding these new researches of Ellis, which seemed irrefragably to confirm the discovery of Peysonnel, some authors, and especially Hill, Targione, and Baster, were still inclined to oppose the system—so difficult is the progress of truth. But Ellis refuted these objections so completely in the Philosophical Transactions, that Baster himself gave way and adopted his opinion.

While the division of the zoophytes was augmenting in number and consistency, by the approximation of newly discovered beings, or of such as had been for a long time removed from it, the groups which had been anciently admitted into it, became more extended and better known by the particular labours of zoologists and travellers. Thus Link, in 1755, published a monograph of the *asteriæ*, which still forms the basis of all that has been done on the distribution of the species of this very remarkable family. Others followed in the same track, and by their attention to particular subdivisions, illustrated and extended our knowledge of these animals.

About the same time the observations of Trembley on

animals of pretty small dimensions, led to the study of animals still smaller, to which the name of *microscopic* has been given. Leuwenhoëk and Hartsoëker led the way, but were ably followed by Hill, Rœsel, and others, who considerably augmented the number of discoveries in this kind. The difficulty of observation, and the want of proper principles to guide most of the observers, prevented those animals from being sufficiently known, to justify systematic writers in assembling them in a single group, or even uniting them to the zoophytes. All subsequent zoologists left them in the same state, just as if the degree of size was of necessity in relation with the degree of organization.

The first systematic author in which we find the microscopic animals arranged, appears to be Hill. As, however, he did not admit the system of subdivision founded upon Aristotle, and has no class under the name of zoophytes, it is not easy to analyze his labours. The animals to which the most recent zoologists give this name, are placed by this author in sections exceedingly remote from each other. The infusoria, under the name of *animalculeæ*, are placed altogether at the commencement of the animal kingdom. It would be equally superfluous and disagreeable to follow him through his groups, and to repeat his learned, but very cacophonous appellations. It is sufficient to remark, that in his system, or no system, the medusæ, actiniæ, hydræ, and asteriæ, are in the same section with the naked mollusca, and that the setigerous annelida are between the insects properly so called, and the amphibia, vertebrated animals.

The work of Pallas on the zoophytes, may be considered as one of the most classic, and the best executed which we possess in zoology. He does not, however, by any means treat of all the animals now comprehended under the name of zoophytes; nor, indeed, are scarcely any of the animals

which the ancients regarded as intermediate between vegetables and animals, to be found among the zoophytes of Pallas; but he has all those with which they were not acquainted, or which they believed to appertain to the mineral kingdom, that is, their *Corallia*.

SUPPLEMENT

ON THE

FIRST CLASS OF ZOOPHYTES.

THE ECHINODERMATA.

THIS term was invented by Klein, and applied by him with sufficient exactitude, as he only comprehended under this name the *echini* of Linnæus, (*echinites*, Lam.) all of which have the skin covered with hard prickles, varying somewhat in form, which has caused them to be compared to hedge-hogs. But Bruguières, by uniting under this name the asteriæ to the echini, has certainly not proved so correct in nomenclature, inasmuch as none of the latter present any traces of prickles on the surface of the skin. M. Lamarck, and the authors who have followed him, have rendered this name still more equivocal by including under it the holothuriæ, and even the sipunculi, which may be considered almost as genuine worms. M. de Blainville has restrained this name to the three orders, holothuriæ, echinites, and asterias; but is yet of opinion, that the name of *placyrodermata*, would better distinguish them, as indicating the principal character which they present, which is the existence of a great number of tentacular and respiratory suckers, by means of which the animal performs the function of locomotion.

The ASTERIÆ, or STAR-FISH, whose species are greatly multiplied in all known seas, are remarkable for their stellated form. Their body is invested with a coriaceous substance, bristling with tubercles or spines, or covered with scales. In some species it has the figure of a flattened pentagon. In others, the angles of the disk extend in lobes, or are elongated into radii, most frequently five in number, sometimes more numerous, and simple, or divided into ramifications.

The mouth, armed with five teeth, of a calcareous substance, is placed at the central part of the animal underneath. No tentaculum is remarked there. It leads into a membranaceous sac, of small extent, which serves as a stomach, and from which the excrements are rejected, and issue through the same aperture. O. Fabricius, and Bosc, are, indeed, of opinion, that the excrements are filtrated through an osseous tubercle, which is observable in the back of the asteriæ, a little on one side. But this opinion cannot be well founded, inasmuch as this tubercle is not existent in all the species of the genus. It seems to be generally wanting in the ophiuri. Besides, we are not acquainted, as it would seem, with any other animal, in which it is necessary that the excrements should pass through a filter, to issue forth from the sac, or alimentary canal. Some short, cylindrical, retractile tentacula, very numerous, ranged in pairs underneath, or on the sides of the divisions of the animal, are developed on the instant, in which it is desirous to hook itself, or to walk. We see on its upper part, but only while it is in the water, an infinity of small conical tubes. The mouth is a sort of respiratory organ, which constitutes with the stomach, and the ovary divided into as many pairs of branches as there are arms, all the apparent organs of the asteriæ. Some osseous articulated stems form the skeleton of each branch. A net-work of the same nature strengthens the rest of the envelope.

The asteriæ are very voracious; they walk with difficulty,

and very slowly. When they swim, they are seen to present their body obliquely to the action of the water, and to agitate their radii slightly. When they want to descend, they suspend all motion, and allow themselves to fall perpendicularly to the bottom. When they have succeeded in getting a shell, they suck out the animal from it through the aperture. They possess a wonderful power of reproduction.

The text is sufficiently explanatory of the organic differences which distinguish the genera.

ENCRINUS was a name first proposed by Ellis, to designate a very singular animal, whose place is still uncertain enough in the natural series, so much so that while many naturalists, with Guettard and Ellis, place it with the family of asteriæ, others with Linnaeus, range it with the polyparia, near the Isis. Ellis, in 1761, read to the Royal Society, a very interesting memoir on this same genus, having made his observations on an individual which came from the coast of Barbadoes. This genus does not appear even yet to have been examined with all the attention it deserves, for it seems indubitable that some of its species, no longer in our present seas, must have been very common there anciently, since nothing is more multiplied in certain calcareous strata, than these fossil remains, known under the names of entrochi, encrinites, &c. Our limits will not permit us to enlarge on the characters of this genus, for which we must refer to the text of Cuvier.

These animals, very probably, live in the bottom of the sea, at considerable depths; but it is not even known whether they are fixed there, which, however, appears very likely to be the case. It is to chance alone that the discovery has been owing of three or four individuals only, which exist in the European collections, and which come from the American seas.

Under the denomination of **ECHINUS**, Linnaeus, and the

zoologists of his school, comprehended all the animals, more or less orbicular, whose cretaceous envelope bristles with a number of spines, of a form more or less variable, and constantly calcareous. This has caused these animals to be compared to hedge-hogs, and accordingly, they are popularly termed *sea hedge-hogs*, or *urchins*, and sometimes sea chestnuts. But at the present day, among modern zoologists, since the researches of M. de Lamarck, this name is reserved for a certain number of species, for those which really better merit the title, in consequence of the long spines with which they are armed.

The exterior envelope, which determines the form of an echinus, (which is described in the text) can be compared to nothing which exists in other animals. In the greatest part of its extent, it is formed by two membranes, one external, and thicker, the other internal, and so thin, that the name of pellicle perfectly suits it, and between which there is a tolerably thick and solid testa, completely calcareous, and composed of a great number of small polygonal pieces, evidently immovable, but not cemented, at least, during the growth of the animal. In the neighbourhood of the mouth and of the anus, the skin is not thus solidified, accordingly, it is sensibly thicker, and much more resistant.

The testa of the echini is entirely calcareous, almost without any mucilaginous or animal part, and is fibrous perpendicularly at the surfaces, which proves that the mode of growth, though taking place upon the edges, nevertheless differs much from the same operation in the shell of the mollusca.

The pieces which constitute the testa of an echinus may be divided into coronal, and terminal. The coronal are those which by their union form the most important part, the most extended, and which circumscribe the body in its circumference; and the terminal are those which surround the buccal orifice, and the anal orifice, and which fill the two apertures

more or less considerable, which are left below or above, by the assemblage of the coronal part.

The coronal pieces are subdivided into ten groups or series, which radiate from one orifice to the other, a little like the ribs of melons, and which form areas alternately full and perforate, equal or unequal. The name of *ambulacraria*, is given to the series which are perforate, and that of *anambulacraria*, to those which are not.

The anambulacraria are themselves constantly formed of two series of pieces, more or less hexagonal, and usually transverse, which are united at one extremity in the middle of the anambulacrum, and at the other, but less angularly, with the ambulacraria. Each piece is raised at its external surface, with a variable number of mammillæ, more or less projecting, well-rounded, polished at their summit, and widened at the base, without any trace of perforation.

The ambulacraria, sometimes more narrow than the others, are, nevertheless, likewise formed of two series of polygonal pieces, united angularly together in the middle line of the ambulacrum, and externally with the pieces of the anambulacraria. They are also raised with mammillæ, more or less salient; but, besides, they are pierced at their external side by pores, variable in number, and in disposition, for each species, but which always traverse the testa from one part to the other. This is what constitutes the ambulacra, properly so called.

The breadth of the anambulacraria is generally greater at the middle than at the two extremities; but this is not the case with the ambulacraria. They are always larger towards the mouth, and the last presents at the interior a sort of apophysis or lamina, pierced with a hole in its middle, and which affords an attachment for the motor muscles of the teeth. These are named *auriculæ*.

The skin which surrounds the mouth is scarcely rough;

there may, however, be remarked on it, some pairs of subcircular scales, a little concave, and which are exactly placed two by two, in the direction of the ray, which should go into the interstice of the teeth; each is pierced with an orifice.

Around the anus the coronal pieces fill almost completely the spaces which are left by the areas. They are, like these latter, ten in number, alternately great and small. All of them are usually granular, and pierced with a hole, much broader, however, in the large than in the small ones, which correspond to the ambulacraria; the large ones correspond to the anambulacraria.

The holes with which the pieces of the ambulacraria are pierced, give passage to small tentacular cuppers, proceeding from the interior lamina of the skin, perhaps, from the hollow respiratory laminæ in their entire length, and terminated at their extremity by a small swelling susceptible of being dilated into a copper, or into a disk denticulated at its circumference. These organs are remarkable for the great contractility which they possess, and can re-enter completely into the interior, something like the horns of snails, or be considerably elongated at the exterior.

Another portion of the locomotive apparatus of the echini, is that from which their name is taken, though more frequently these organs merit the name of little clubs, or tubercles, rather than that of bristles. What they offer in common, is the having at their base, a small spherical concave head, with a circular pad above. Their length, their form, and their thickness, are extremely variable, and generally in relation with those of the mammillæ of the testa. Their structure is equally peculiar. When broken they have a vitreous sort of brilliancy. Their external surface is almost always finely striated, and they are composed of concentric strata, each of which is formed of a great number of irradiated fibres.

These organs, articulated like a knee on the mammillæ of

the testa, are put in motion in every direction by the external lamina of the cutaneous envelope, which attaches itself to the circumference of the pad of their base, and which appears stronger, and more evidently muscular at the spines of the base of the echinus. In desiccation, it is impossible to perceive any distinct muscular fibres, and sometimes even any muscles, properly so called.

These animals are all aquatic and marine. They, nevertheless, constantly live on the sea-shore, in rocky and sandy places. They are very rarely found abandoned by the tide. It would seem, that if too much advanced to recede, they possess the faculty of sinking more or less deeply into the sand. In this case, it is easy to recognize the place where they are, by the existence of a small hole in the form of a funnel, which is remarked at the surface of the sand. They sink and recede considerably less when the weather is fine, than when it is tempestuous.

The echinus, in locomotion, which is never very quick, makes use of its tentacular suckers, and its prickles, and especially of the inferior ones. But it appears, that this cannot take place, except on a resistant soil. In the first case, it elongates as far as possible (and it is astonishing the extent to which it can be done) a certain number of the suckers, which are in the direction in which it wishes to go. It attaches these strongly to some solid body, causing a vacuum by means of the coppers which terminate them, after which it contracts them, and thus draws its body towards this point. By thus reiterating the same manœuvre, the echinus may, without doubt, advance with some degree of rapidity. In the second case, when it employs its prickles, it extends those on the side where it wishes to move, to the utmost possible degree. Then it lowers them, pushing itself on with those on the opposite side; and as it has some in all directions, it is evident that it can walk in all ways. In general, its progress

is performed by turning, although the animal, nevertheless, finishes by arriving at the end which it desired to attain.

The echini are said to be eminently carnivorous. It is even admitted that they feed upon crustacea and bivalves, but this is probably rather a conjecture deduced from the strength of their jaws, than a fact ascertained by observation. M. de Blainville has opened many, either taken alive, or preserved in spirits of wine, and never found any thing but sand in their stomach. M. Bosc, however, was a witness of the mode in which an echinus got possession of a crustaceum; and it appears, that as soon as the latter was caught by some of the tentacular suckers, it was speedily masticated, and swallowed.

We are yet ignorant of the mode of reproduction in the echini. We only know that it is in spring that they deposit their spawn, which appears to contain an almost countless number of eggs; and it is probable, that it is rejected in a mass all at once. But it does not appear that any naturalist has witnessed this.

Genuine echini are known in all the quarters of the globe. The largest and most numerous, however, belong to the seas of warmer latitudes.

The HOLOTHURIAE were placed by Linnæus and Bruguières among their molluscous worms; and subsequently ranged by Pallas, Cuvier, and Lamarck, who better studied their relations near the asteriae and echini. We shall not repeat the characters of this genus here.

Many authors, such as Hill, Brown, and Baster, have given the name of actinia to this genus. Linnæus, for some time, gave it that of *priapus*. Görtner preferred the denomination of *hydra*, and confounded these animals with the actiniæ proper. This was imitated by Bohatsch. Pallas returned to the name of actinia, which he divided into two sec-

tions; one comprehending the holothuriæ, and the other the true actiniæ.

The holothuriæ, which the ancients usually comprehended under the vague name of *purgamenta maris*, or of *pudenda marina*, are found, as it would seem, in every sea, the deepest parts of which they most particularly inhabit, even as far as three hundred feet and more. It is even to this cause that the peculiarity seems owing, of these animals vomiting, as it were, their intestinal canal, in consequence of the great difference of pressure. They more particularly remain in the oozy bottom, and in the anfractuosities of the rocks, where they fix themselves by means of sorts of cuppers, or papilli, from tentacula, with which certain parts of their bodies are provided. They can, by means of these organs, draw themselves along over the submarine bodies, and thus change place. But it appears, that they can do so likewise, either by alternate flexions of the body, after the manner of worms, or even by filling their body with water, and shooting it forcibly through the anus, so as to be able to swim, assisting themselves with their tentacula. They feed on pretty strong marine animals. It is thought that they are hermaphrodites, and that they reproduce by internal gemmulae, like the actiniæ, whence it has been said, that they are viviparous. Fabricius, in fact, tells us that he found in the anal part of one individual a young holothuria, swimming freely.

The organization of the holothuriæ had been studied by many anatomists, and among others, by M. Bohatsh, and by Vahl, but in an incomplete kind of way. M. Tiedmann, in his dissertation, which gained him the prize proposed by the Academy of Sciences in Paris, has added very considerably to our acquaintance with this subject.

The species of this genus appear to be rather numerous, and especially so in the seas of cold countries. But they have been in general too ill described to be charac-

terized. Some small generic groups have been introduced by some naturalists. Thus M. de Lamarck has separated the species whose tentacula are formed by small denticulated and pedicled disks to form his genus *fistularia*. M. Oken had already extended these divisions much further, since he has established four genera according to the consideration of the disposition of the retractile tubes, and the form of the body. As these animals are extremely altered in appearance, when they have been kept for some time in alcohol, it becomes rather difficult to characterize the species. They seem to form a passage from the radiata to the worms, and perhaps even to the mollusca; for, in fact, we find some species which have altogether the form of the thalassema, and others which exhibit at the first glance, a resemblance to some dorides.

SUPPLEMENT

ON

THE ENTOZOA.

THE reader will doubtless have remarked that the allocation of these animals among the zoophytes, or radiata, will admit of some controversy, inasmuch as they are neither plant-like nor radiated, and appear to have much more analogy with the annelides, which they would seem more properly to follow in the natural series.

The study of the worms, which are entirely apodal, and which have no trace of appendages serving for locomotion, was pursued but little until the middle of the last century, and more especially that of such species as live continually in the interior of other animals. Attention to them seems to have been chiefly originated by a prize proposed by the Royal Academy of Sciences in Copenhagen.

The ancients have scarcely noticed the round and flat worms, and that solely in a medical point of view, confining themselves to those which infest the human species. They have further limited their labours in this way to mere nomenclature, without giving any external description.

The few authors who occupied themselves with the history of the distinction of animals, previously to the revival of literature, have added but little to our acquaintance with this subject. From Isidore de Seville, Albertus Magnus, Belon,

and Rondelet, we derive nothing in addition to what the ancients have left us; and Gesner and Aldrovandus, who compiled with so much patience, and frequently with so much sagacity, all that had been said by their predecessors, one in an alphabetical, the other in a systematic form, have collected nothing new respecting the worms, and more particularly respecting the intestinal ones.

It was only, in fact, towards the end of the seventeenth century, that the science of helminthology may properly be said to have had its birth, and this birth took place in Italy, the mother of almost all modern art, science, and literature. To that country belong the names of Redi, Malpighi, and Vallisnieri.

The popular name of *worm*, under which these animals have been included, sufficiently indicates that their body is almost always cylindrical, more or less elongated, attenuated at the two extremities, and of a diameter infinitely less than the length. In some the body is more perfectly cylindrical, in others sacciform. Even a certain number resemble bladders, as the hydatids; or very depressed laminæ, as the fasciolæ, &c. Whatever be its form, it is always perfectly symmetrical, as in all other binary animals, and most frequently the dorsal face may be distinguished from the ventral, by a little more convexity in the former than the latter.

It is but seldom that we can trace in the body of these animals the distinction of head, neck, belly and tail. Nevertheless, it sometimes happens that the anterior extremity is enlarged, and is well distinguished from the rest of the body, and then the animal is provided with a cephalic enlargement, as in *tænia*, &c. But most usually the body, attenuated in front, swells out by degrees, and again becomes attenuated at the posterior extremity.

In many of these animals articulations may be observed, but they are sometimes extremely indistinct. In other cases

the articulations are so much separated, that they seem to form a sort of chain, which breaks with the greatest facility.

Never, or scarcely ever, are any appendages observable on each side. The worms, in fact, are easy to be recognized by this great simplicity in the external form.

Their organization, too, in general, is but little complicated, and often, in consequence of their smallness and the transparency of their tissues, it may be observed through the teguments. It is particularly when they are young, and living, that this transparency is almost perfect.

The external envelope, or skin, is almost always confounded with the muscular substratum, which serves for locomotion.

The dermis is consequently not distinct; it is always very soft, of a nature almost mucous, and we cannot distinguish above it, any other of the parts of the skin, such as they have been analyzed in this envelope, in superior animals. Thus, neither papilla, nor epidermis can be recognized. The vascular net-work alone is sometimes tolerably developed, and we may remark there a pigmentum sufficiently marked, at least in some species; but all that are parasites in the intestinal cavities, or parenchyma of animals, are constantly white, unless they should be filled with some colouring matter, which may be perceived, in consequence of the transparency of their exterior envelope.

In a very small number indeed have any indications been observed of special organs of sensation.

The apparatus of locomotion consists solely in the muscular stratum which doubles the skin, and the intestine itself.

We cannot even say that these animals have true muscles. The muscular stratum is merely divided into eight longitudinal bands, by the dorsal, ventral, and lateral lines, which are themselves composed of interrupted fibres. In the vesicular species, where the body terminates by a bladder, the muscular fibres radiate all around its parietes.

As there are no appendages, it is evident that there can be no muscles for the purpose of moving them, though some indistinct fasciculi may be observed in some of the exterior species.

The apparatus of nutrition is also very simple in the entozoa.

As for that of digestion, or the intestinal canal, it is generally extended from one extremity to the other of the body, at least when it is complete. At other times it is irregular or ramified, and, finally, in a certain number of species it is vascular, or even sometimes completely imperceptible, or even nullified.

When complete, it extends almost directly from one extremity to the other, but never without being free or distinct, and consequently without any serous or peritoneal membrane. It is truly comprehended in the cellular parenchyma, which constitutes the mass of the body.

The mouth, almost terminal, is almost constantly very small and circular.

It is never armed with teeth, properly so called, whether calcareous or corneous. Sometimes certain projections, or swellings, of the muscular contractile tissue may be found, the edges of which bristle with remarkably fine denticulations.

As there is no real armature of the anterior orifice of the intestinal canal, we may easily conceive that there never exists in these animals any distinct buccal mass.

Neither are there any salivary glands.

We may say, that in general, in the extent of the intestinal canal, there is no distinction of oesophagus, of stomach, properly so called, of small intestine, and of rectum; such at least is the case in all the truly intestinal worms.

No organs have been met with that could be regarded as a liver, and still less as a pancreas. If the first does exist, which

appears by no means probable, it is contained in the parietes themselves of the intestines.

The termination of the intestinal canal, or anus, is always medial, and yet approaching to be terminal.

This is the first sort of digestive apparatus found in the entozoa. In the second sort, there is still a terminal mouth, in the form of a sucker, and without armature; but the intestinal canal, which originates from it, after having been prolonged towards the middle of the body, is lost immediately in vasculariform ramifications, which proceed into all its parenchyma, and then there is no trace of anus.

Finally, in the third sort, the digestive system does not commence by a single medial orifice, or by a true mouth. There is even no true intestinal canal, but two or more anterior and lateral pores or orifices spring from the vessels which are united to two lateral trunks; these are prolonged throughout the entire length of the body, anastomosing together, and ramifying, without doubt, into the parenchyma of the animal. This is the organization of the *tæniæ*, &c.

In the ligula, which are the most simple of all binary animals, we can no longer recognize any trace of an intestine, of whatever sort it may be, and consequently no circulatory system.

A special respiratory apparatus exists in none of the animals of this class. The organ, therefore, of respiration is essentially limited to the skin, nor is there, in fact, any true respiration, except in certain families, where something like circulation may exist.

The blood, or recremential fluid, has been but little studied.

The apparatus of decomposition consists solely of the organ of generation; for no other glands exist in any genus of this group. There are several distinct sorts of it, since it is sometimes composed of female and male parts separated on dif-

ferent individuals, and sometimes of such parts on the same individual; at other times of female parts alone, and in fine, we sometimes find scarcely any indications whatsoever, of this apparatus.

The existence of a nervous system in these animals is very doubtful, at all events in those which may be properly termed entozoa. No one has been able to recognize any thing of the sort in the *tæniæ*, or neighbouring genera.

The organization of the product of generation in both, in the exterior and interior worms, has not been sufficiently studied. Such eggs as have been discovered are oval, and very regularly formed. They all appear to be in reality eggs, with a distinct envelope containing grains. But this was the most that could be distinguished, even with the microscope.

The physiology of worms presents nothing which can really be considered as peculiar to themselves.

Their general sensibility appears to be considerable. In fact, at the slightest contact of a solid body, or even of a liquid of a heat or nature different from that in which they are plunged, they torment themselves, and twist about in all directions. The *tæniæ* do this almost as much as the others, but only in a less extended portion of their body at once. A special sensibility they do not seem at all to possess, nor any perception of bodies, whether by savour or odour, and still less by the luminous rays which they send forth.

The contractility of worms is evidently very great, and that almost in all their tissues, so that they have considerable power of changing form and dimensions, as may be particularly observed in some of them, which are almost in a continual state of agitation. Their locomotion is, therefore, sometimes tolerably active.

They seem, in general, to possess but little tenacity of life. Some, indeed, such as *tæniæ*, have been observed to live many hours after having been extracted from the intestines.

tinal canal of an animal which had been dead for several days. The ascarides and distomæ may be preserved alive for many days. Rudolphi even speaks of one species of ascaris, the *A. spiculigera*, which was resuscitated, after being extracted from the intestine of a bird, which had been for twelve days in very strong spirits of wine.

We are in possession of no proof that they can reproduce any individual part which may have been lost or taken away.

We may say, in a general manner, that all these animals comprehended under the name of worms, or entozoa, live constantly in a fluid, and never, or at least very rarely in the atmospheric air. This fluid may be either living, or at least constituting part of a living body. In this case, they are more peculiarly entitled to the appellation of intestinal worms, or entozoa; and, in fact, the great majority of the worms are intestinal.

There is no tissue, nor any constituent parts of living bodies in which some of these worms have not been found. They are most frequently at the surface of some portion of the exterior envelope, which has re-entered, to form either the intestinal canal, the lungs, or organs of respiration, or the genito-urinary apparatus. But at other times they are found in the tissue itself of these parts, in the parenchyma, as in the brain, the vessels, the muscular system, &c.

Moreover, there is scarcely any animal in which some of these intestinal worms have not been found, at least if we speak of all the classes of the vertebrata; for among the invertebrata, they seem to be more rare. But as they have been as yet so little sought for in these latter tribes, it is impossible to assure ourselves that they are so few as has been generally asserted and believed.

It has been remarked that no intestinal worms have as yet

been discovered in the guinea pigs, though they have very frequently been sought after in those animals.

Among vertebrated animals, the entozoa are in general more common and more numerous in the aquatic species than in the others ; more so in the females than in the males ; more so in the young than in the old ; and, finally, more so in weak individuals than in vigorous subjects.

It has been for a long time admitted in a general way, that each intestinal worm more peculiarly infests some one animal, and even a determinate part of that animal ; but this opinion can by no means be supported in any positive manner. In fact, it is certain that the *ascaris lumbricoïdes*, for example, is found in the human species, in the horse, the pig, and some other animals. It is equally proved that the same species of *tænia* is to be found in the cat and in the dog. Nor are we less assured that the *bothryocephalus punctatus* is to be met with in the barbel, the turbot, and several other species of *pleuronectes*.

Nevertheless, there are some species which are evidently peculiar to some particular species of mammifera, such as the human *tænia* and the *bothryocephalus*.

Locomotion in these animals is but seldom, even slightly extended, and a certain number of them do not possess the faculty at all, but remain fixed in the parts in which they live. These, then, are strictly parasites, altogether fixed, as are the *echinorhynchi*, and the majority of the *tænioïdes*. There are only, in such cases, some partial movements, or a sort of undulation in those parts of their bodies which are not adherent. It is not the same with several other species, such as the *ascarides*, and even the *porocephali*, in which there is a true general locomotion, or total transport of the body, in the parts which they inhabit, for it is certain that the *ascarides lumbricoïdes*, whose normal position is in the small

intestine towards its origin, do sometimes ascend into the stomach, or descend into the large intestines. They have even been known to penetrate into the peritoneal cavity, after having perforated the intestine, or taken advantage of some previous perforation which had been made there.

The nutriment of the worms is generally animal, and in a fluid state, as may be supposed from the formation of their buccal orifice. Among the external worms it would seem that there are some exceptions to this rule ; but with such we have but little to do in the present place.

The mode in which this nutriment is taken is very simple, since in general it is drawn in by the successive action of the parietes of the intestine, performing the office of a sucking pump. This is quite obvious in the medicinal leeches, which are so analogous in structure to the animals of which we are now more particularly treating, and the like probably also takes place with the ascarides. But in these last, nutrition must also take place by the action of the skin, plunged in the mucous or chyleous matter, which lines or fills the intestinal canal which they inhabit. As for the porocephali, the echi-nocephali, and particularly the bothryocephali, and ligulæ, it is clearly evident that they can have no other mode of nutrition, the intestinal canal being no longer existent in them, or being reduced to a merely vascular state. All the nutriment is taken by the action of the suckers of the oral extremity, or by those of each ring as in the tæniæ, the bothryocephali, and lastly, by the pores of the skin alone, as must necessarily take place in the ligulæ.

In those in which the sexes are distinct, as in all the ascarides, it is certain that the males are always obviously less common than the females, and, most undoubtedly, must be considerably less numerous. There are even some species in which it is very rare to find any, as in the ascarides, properly so called. There are more in the strongyli.

The mode in which the intercourse of generation takes place, is but little known. M. Bremser has observed it in the strongyli. The pouch or sac of the male embraces the vulva of the female.

The result of generation after this intercourse, or even when no intercourse takes place, as is the case with all the monogamous species, is, as we have already said above, often innumerable eggs, as in the tæniæ, for example. These eggs do not adhere to the mother. They are formed in the meshes of the cellular tissue which constitute the ovary, and are rejected through a determinate orifice, in most cases, or through a simple rupture, as in the tæniæ.

Be this, however, as it may, they fall into the substance in which they are to be developed, without receiving any particular arrangement or disposition from the mother; with the hirudines, which we have so often said are very analogous animals, if, indeed, they ought not to be placed in the same class, the case is different. Their eggs are united in small packets, by a general mucous envelope, and are arranged by the mother in determined circumstances. Such appears never to be the case with the entozoa.

We know nothing, or scarcely any thing respecting the mode in which their eggs are developed. M. Rudolphi thinks that their development is rapid. Nevertheless, it appears, that in the bothryocephalus, so common in the *pleuronectes maximus*, the young subjects bear no resemblance to the mother. They at first exhibit no trace of articulation. The cephalic enlargement constitutes almost alone the whole of the body of the animal, which is terminated rather abruptly, by a small caudiform elongation. In the next degree of development, the body increases in size. The articulations become sensible by simple lateral denticulations. They are as yet few in number and very long. By degrees they cut and wrinkle, and other articulations become defined. This cir-

cumstance, at the same time that the body is continually shooting out, finishes by giving to the latter a very variable length, but which sometimes exceeds two feet. We may then observe some of these articulations, and more frequently the posterior ones, fill by degrees with eggs, of somewhat a different bulk, but of the same oval form, and which after they issue forth, in their turn produce young bothryocephali.

There are two interesting questions respecting the development of the intestinal worms; first, can such and such species only, be developed in the body of such and such animals, and may not this development be sometimes continued in another animal?

The successful experiment of Pallas, in introducing the eggs of the *tænia elliptica*, into the abdominal cavity of a dog, is a reply to the first question.

As for the second, it appears certain that the ligula, when it is found in fishes, never presents itself in the adult state, or with developed ovaries, which is quite the reverse of what is observed when it is taken in an aquatic bird. M. Rudolphi, therefore, supposes, that born in the fish, it only acquires its full development in passing into the birds, and that this is owing to the heat of their body. He brings forward, moreover, in support of this opinion, the case of a bothryocephalus, which in the imperfect state (*B. solidus*), is found in a species of gasterosteus, and in the adult state (*B. nodosus*), in aquatic birds only. He further explains by this, the curious fact, that in the northern countries of Germany, and in Denmark, where this little fish is common, the aquatic birds are infested with the *B. nodosus*; while in Southern Germany, where this gasterosteus does not exist, the aquatic birds have not this bothryocephalus.

We shall particularize only one species of this disgusting

class of animals ; namely, the *F. medinensis*, belonging to the filariæ, commonly called the guinea-worm.

This species, the most celebrated of all, is very long. The edges of the mouth are inflated, and the point of the tail is inflected. It is of the size of a small cord, and of the same diameter almost throughout. Its head is provided with a sort of sucker, formed by the inflation of the lip which surrounds the mouth, the orifice of which is very small. The tail is terminated by a sort of inflected hook. Its colour is the same as that of most of the worms that live in the interior of animals ; that is, a dirty white, passing to yellow in alcohol. In length, it appears to vary considerably. Kœmpfer speaks of a foot, of a cubit, and more. Grundler describes the one that he has seen, as being three feet and a half, Rhenish measure. Kemsemuller says it frequently exceeds two ells. Gallandat gives it eight or nine feet ; and in fine, Fermin carries its length to eight or nine ells, which appear, indeed, to be somewhat improbable. Be all this, however, as it may, this worm appears hitherto to have been found on the human species alone, in the cellular tissue of different parts, and especially in that of the legs, towards the malleoli. It also appears to be endemic in the burning regions of the old and of the new continent. The names of *medina-worm*, and *guinea-worm*, have been given to it, from the places where at first it was observed.

There are among observers, great dissensions respecting the origin of this worm. Some think that it is exterior, that it is a true *gordius*, and that it insinuates itself into the skin of such persons as walk barefooted ; that it deposits its eggs there, grows, and is developed there, and produces by its presence such painful symptoms, that it has received the denomination of *furia infernalis*. Proofs have, in fact, been given that it may exist in this manner for a considerable length of

time. Other authors maintain that it is a worm altogether interior, and allege, in support of their opinion, that it has never been found out of the body of man ; that it is entirely similar to the other species, and especially to the filaria of the simia ; and that it is more probable, that it is born in the interior of the parts ; that it may exist there for months, nay, entire years, without producing any sensible accidents ; and that it is only when it approaches the skin, when it pierces it, that these accidents may become serious enough to produce intense pain, or other alarming symptoms. This is pretty nearly the opinion of M. Rudolphi, and it appears the most probable. Nevertheless, some persons, more versed in the art of surgery than in zoology, and influenced, no doubt, by the existence of a sort of inflammatory tumour, which the presence of the worm produces at the skin, have ventured, in these latter times, some doubts concerning its real existence, thinking it might be nothing but the cellular tissue itself, struck with death, which thus moulded itself, as it were, into a worm, in traversing the thickness of the skin. M. Delorme, in a letter inserted in the eighty-seventh volume of the Journal of Physical Science, has shown by facts, how erroneous is this opinion ; he has confirmed all that was known concerning the symptoms, and even the treatment of the affection which follows the appearance of the worm at the skin. The symptoms are a tumour with redness, and most violent pain. Soon a little orifice appears, through which the worm puts forth a small part of its body. The treatment consists in seizing this part and rolling it with much caution round a small stick, which is turned very gently every day, for fear of breaking the body of the animal, which would render the extraction more difficult ; besides that, the presence of the remaining part which would putrify, might occasion accidents still more fatal. The observation has been made, that the people who walk barefooted, like the negroes, are more fre-

quently affected by it than others; and that it is towards the malleoli that the affection takes place. This is difficult enough to explain on the hypothesis that these animals issue forth from the splanchnic cavities; for it does not very clearly appear why very nearly all of them should come out at the same place. The medina worm may yet become the subject of very interesting observations.

SUPPLEMENT

ON

THE ACALÉPHÆ.

IN our supplementary observations on this class, we must chiefly confine ourselves to the *Acalephæ simplices*, which are mostly comprised in the great genus MEDUSA of Linnaeus, and to which M. de Lamarck has given the name of *Medusariæ*.

These animals are extremely numerous in all seas, but more particularly in those of warm climates, have been remarked at all times by the inhabitants of the sea shore, and by all authors of natural history, from Aristotle down, though they are scarcely of any utility to the human race. But the singular property which they possess of being luminous to a great degree in darkness, or obscurity, and that of producing a painful sensation similar to the sting of nettles, when any of them are touched, must have occasioned them to have been observed early. Accordingly all maritime people have particular denominations to designate them. These names almost always indicate one of these two properties, such as *knide*, *acalaphe*, *urtica marina*, *sea-nettle*, &c.

These acalephæ have a regular form, very circular, hemispherical, more or less convex above, and concave underneath,

with a simple, rounded, medial orifice, usually very large, surrounded, or not, with appendages of variable form. The union, in a greater or less portion of their edge, of these buccal appendages, constitutes a common pedicle, the cross-wise attachment of which divides the orifice into four parts.

The hemispherical, and principal portion of the body, is termed, as we see in the text, *umbrella*. The buccal appendages are called arms. The part composed by their union is called pedicle.

The umbrella, always regularly circular, is sometimes very much depressed above, as it is underneath. At other times it is subcylindrical from its great elevation. It is rarely globular, finally, and most frequently it is nearly hemispherical. Its edges, or the line of junction of the convex with the concave part, are sometimes entirely smooth, rarely raised into angles, a little salient, or sub-lobate, or tuberculous. Most frequently they are furnished with tentacular filaments, more or less elongated, and which have been called *tentacula*. We remark, also, in a certain number of species, in different points of the circumference of the umbrella, similar organs, at regular intervals, the use of which is unknown. They are designated by the name of auricles. The aperture of the middle of the concave face is sometimes very great, round, or squared. It is sessile, or at the extremity of a sort of labial elongation, in the form of a proboscis, or funnel, more or less elongated. In the circumference of this aperture, whether sessile or not, are often remarked appendages or arms, sometimes rather long, of a fixed number, and which are divided or ramified in all their extent, or at their extremity only. Between these divisions are sometimes seen some organs which Pallas and Peron have compared to the cotyledons of vegetables. These appendages are often attached to the circumference of the sessile mouth, and sometimes more or less high on the proboscis. But it sometimes happens that

they are also united in a more or less considerable portion of their extent. From this results a pedicle, sometimes very thick, which appears to divide the mouth into four parts.

These acalephæ, which vary considerably in bulk, since, though there are some truly microscopic, there are others which attain to several feet in diameter, and weigh fifty pounds, are of all animals those which have the least of solid substance. They are composed, as it were, of a sort of jelly, more or less consistent, perfectly transparent, which, in consequence of the loss of life, resolves itself into a limpid salt water, leaving as a residue but some grains of membranaceous parts equally transparent.

The tissue of the medusæ is not then really homogenous, though it appears to be so. Their skin, or envelope, is nevertheless of an extraordinary thinness, not distinct. This may be considered but as the boundary of their tissue a little condensed. Observed with a microscope, M. Gaëde perceived that it was furnished with small grains, each of which appeared to be composed of grains still smaller. Might this be the source of the viscous matter, which transudes from all parts of the body, and which Peron says that he has observed in individuals put into sea-water frequently renewed, to enable them to preserve all their vital activity, and which is so abundant, that the thirtieth portion of water is as much charged as the first. This does not seem probable. It might, perhaps, rather be believed that this is the origin of the eminently phosphorescent substance, which Spallanzani has remarked in certain parts of the body of the luminous medusæ, and which possesses properties different from those of the liquor which issues from a wound. The latter has the taste of salt water, and the other causes a painful sensation, to that degree that having touched it with his tongue, Spallanzani felt a burning impression which lasted more than a day; a drop having by chance fallen upon his eye, the pain was

still more intense. The caustic quality of this humour is not, however, always in accordance with the phosphorescent property, since there are species which are not luminous, but which, nevertheless, produce a sting.

These animals are in general perfectly colourless, and resemble the purest and most transparent rock-crystal. There are some, however, which have coloured parts, reddish, fine ultra-marine blue, greenish, &c.

The apparatus of sensation in the medusa appears to be limited to the skin. The name of tentacula, which has been given to the filaments, more or less elongated, which border the umbrella, the use assigned to them, as well as the brachial appendages in certain species, might cause it to be suspected that these organs enjoy a more exquisite sense of touch. But there is nothing in the organization of these parts to confirm this suspicion, and it is not even certain that these organs serve for the uses which are attributed to them.

No trace of nervous system has ever been observed in these animals, nor is it probable that any exists.

If, after investigating the organization of the medusæ, we turn our attention to the study of their functions, we shall still find many other phenomena equally worthy of observation.

Their general sensibility appears to be extremely obtuse; and, perhaps, it is the same with the special sensibility of the marginal and buccal tentacula, whose power of contractility, however, appears to be very great. The medusæ do not seem to feel the hand that seizes them.

Their locomotion, which is very slow, and denotes a very feeble degree of muscular energy, nevertheless, appears to have no cessation, since, being of a specific gravity more considerable than that of the water in which they are immersed, these animals, so soft, that it is probable they could not rest upon a solid ground, are obliged to move incessantly to sus-

tain themselves in the fluid which they inhabit. Accordingly, they are in a continual motion of systole, and diastole. Spallanzani, who has observed them carefully in their motions, says that those by which they change place, are executed by the approximation of the edges of the umbrella, so that its diameter diminishes in a very considerable manner. By this a certain quantity of water contained in the stomachs, and in the cavity of the umbrella, is expelled with greater or less force, and the body is projected in an inverse direction. Returned by the cessation of the muscular force to its first state of development, it contracts itself afresh, and makes a new step. If the body is perpendicular to the horizon, this succession of contraction and dilatation causes it to ascend; if it is more or less oblique, it advances more or less horizontally. To descend, it is sufficient for the animal to cease its movements; its weight alone draws it down. It is never in an inverted position, with the convexity of the umbrella underneath. Neither the tentacula nor the arms appear to be employed in these movements of transportation, at least the latter, according to Spallanzani, are always extended following the body. Some ingenious experiments related by this observer, prove that it is only the muscles of the marginal zone of the umbrella, which cause it totally to contract, since, on removing them, the remainder of the umbrella undergoes no change, while the removed zone continues its movements of systole and diastole. In spite of this almost continual action of the locomotive faculty, the medusæ do not appear to be able to overcome the smallest current, but are constantly carried away by it.

According to all observers, the medusæ feed on little animals, on mollusca, worms, crustacea, and even fish, which they attract towards their mouth, by means of the appendages with which it is armed. Spallanzani has supposed this, because he saw a small fish which was attached to one of the

appendages of an individual which he had just caught. M. Gaëde says positively that he found in the stomach of the medusæ which he dissected, some small fishes and nereids. M. de Chamisso and Eysenhardt, in their memoirs on these animals, assure us that they have found several times in the ventricles some heads and remnants of fish, as it were digested. Several other naturalists, who have had copious opportunities of observation, aver the same thing; and M. de Blainville has found some small fishes in the equorea, and even in the rhizostoma. But he queries whether these little animals were seized by the medusæ for the purpose of nourishment, or that they came there accidentally. The last opinion is that of M. Cuvier, at least regarding the rhizostoma, which appear to him to derive their nourishment through species of suckers, as we have already stated.

We have been hitherto in ignorance, and, probably, shall long remain so, concerning the duration of life in the medusæ, as well as the history of their development. It is probable that they are rejected by the mother in a perfect state, and differ from her only in size. It is known that they are larger in spring and summer, that is, at the time when their ovaries are distended by the eggs which they contain, and that in the other part of the year they are smaller. It is also known, that the appendages acquire with age a development and a complication, which they did not at first possess.

We find some species of these animals in all the seas of cold climates, as well as in those of warm, and more especially far out at sea. Each, according to the observations of MM. Peron and Lesueur, appears to be confined to determinate portions of the globe, where the individuals are united in innumerable troops, and sometimes form many square leagues in extent. If they appear and disappear sometimes at determined periods, that, doubtless, depends upon the regular winds and currents which carry them away and bring them

back. They are sometimes thrown in great quantity upon the shores of our climate, where endeavours have been made to turn them to some advantage. It has been attempted, but without much success, to extract ammonia from them. They have been more beneficially employed in the way of manure upon arable land.

All the medusæ in a state of death and putrefaction, appear to be phosphorescent; but there is only a small number which appear to be so in the living state. We are indebted to Spallanzani for a great number of curious experiments on this subject. He first endeavoured to discover what the parts are which more particularly possess this singular property. And he found that they were, 1st. the great tentacula, or arms. 2nd. the muscular zone of the umbrella; and 3rd. the stomachal cavity. The rest of the umbrella only shines by transmitted light. He then occupied himself in observing to what cause the phosphorescence is owing, and he became convinced that it was to a peculiar glutinous humour, which issues from the surface of the three parts just mentioned. This, however, as we have said farther back, is altogether different from that which issues from the body, and even from these same parts, when they are cut. It is very corrosive, and its application on the hand, and on the tongue more especially, occasions a lively sensation of pain. Expressed into different liquids, as into salt water, but particularly into fresh water warm, or milk, it communicates to them a phosphoric light. A single medusa thus expressed into twenty-seven ounces of cow's milk, rendered it so resplendent, that one might have read the characters of a letter by it, at the distance of three feet. At the end of eleven hours, it retained some degree of light; when it had lost this altogether, it was renewed by stirring it, and, finally, when this means no longer produced any effect, it was again obtained by heat, care being taken that the heat was not too strong. The dead medusa also still possessed

for a considerable time the phosphorescent property, and it was renewed by pouring fresh water upon it, even some time after it had ceased to shine. On the living animal, it is stronger in the state of contraction than in that of dilatation, which is easily explained, because it is the part which is particularly contractile, which exhales the phosphoric humour. The light may be suspended for more than half an hour, which depends on the cessation of the oscillations, and nevertheless the phosphorescence continues, although to a degree much less intense, in the dead animal, even to putrefaction. The phosphorescence is increased by giving a commotion to the parts of the animal, or even by rubbing it with the hand. When it is living, it communicates to the water in which it is plunged, its phosphoric property, but half as much again in fresh water as in salt.

Certain of these animals possess another property which is more hurtful, which is that of producing a very sharp pain, when they touch any part of our skin, which has occasioned them to be called *sea-nettles*. Dicquemare, who has made experiments in reference to this subject on himself, with the *cyanea cærulea*, relates the effects of them in these terms ; "The pain is pretty nearly similar to that which is felt on touching a bunch of nettles ; but it is stronger, and endures about half an hour. In the last moments reiterated stings are felt, but proportionally more faint. There appears a considerable redness in all the part which has been touched, and swellings of the same colour, which have a white point in the middle. After the end of some days, when the pain is gone by, the heat of the bed will cause the blisters of the skin to re-appear." This effect appears owing to a caustic humour, which issues from the skin of the medusa. Is it different from that which produces the phosphorescence ?

This appears probable, since, as we have observed before, the species noticed by Spallanzani, which was eminently

phosphorescent, produced no effect of urtication. The species which possess this property in the living state, have it also when dead. Certain others possess it in so small a degree, that it becomes sensible only in the softest parts of the skin.

Attempts have been made to ascertain whether the medusæ are susceptible of a reproduction of the parts which have been removed from them; but such does not appear to be the case.

The medusæ serve as food to several other animals. The actiniæ seize these acalephæ on their passage, and draw them by degrees into their stomach. The whales also destroy an immense quantity of them; but it appears that these are species or individuals of an exceeding smallness, with which the waters of the sea, inhabited by these great animals, are filled, and that they are there with many other animals of different types, but which are likewise almost microscopic.

The PHYSALIÆ, which constitute the type of the second division of acalepha, are a very singular race of animals, noticed for a long time by sailors, who give them the names of *galleys*, *frigates*, or even *ships of war*, in consequence of the elegant manner in which they seem to sail on the surface of the waters. They have received the name of *physaliae*, or *sea-bladders*, in consequence of their resemblance to a bladder, or even that of *sea-nettles*, because it appears that they produce the same effect upon the skin as the medusæ. Some recent writers have thought proper to place them among the mollusca; and certain it is, that they present little or nothing of the radiated arrangement; but as the Baron observes, the total absence of internal and complicated organs, of which he has satisfied himself in many large individuals, will not allow us to admit of the notion that the physalia may be one of the mollusca.

M. Tilesius writes thus concerning the physaliæ: all the physaliæ consist of a long bladder inflated with air, floating on the water, having upwards a sort of comb, which answers as a sail, and underneath some long tentacula, which constitute at once the mouth and helm. Although to examine these is difficult enough, because they burn more strongly than nettles, when they are touched, he has been enabled to distinguish three different kinds at least, on separate individuals.

M. Tilesius has made most observations on the sting produced by touching these animals. He ascertained that the burning sensation which is felt, when one has touched more or less strongly the tentacula of a living physalia, and which is more intense than that produced by nettles, is owing, not to a mucous matter which covers them, as he had supposed at first, but to some little hairs of a rose colour, which the mucosity introduces into the pores of the skin. In fact, one day when he was severely burned by handling too much the tentacula of a physalia, after having tried without success to calm the pain, with vinegar, solution of salt-petre, salt, sulphuric or ammoniac acid, he only achieved the point by frequent lotions of soap and water on the affected parts, having previously carefully taken out the little hairs with a tweezers. We must, nevertheless, believe that the mucous matter itself also possesses this burning property; for the same observer found, that on washing himself in a porcelain vase, in which a physalia had been preserved, and which had not been sufficiently cleaned, his lips, nose and cheeks, were severely burned.

The physaliæ live in the waters of the sea, at tolerably great distances from the shore; except when they are driven thither by currents, or by the wind. Observers not having seen them, except at the surface, it has been generally admitted that they are always there, the bladder being partly out of the

water, and the tentacula, &c. more or less deep in the sea. M. Tilesius adds that these animals sound with their tentacula all the bodies which may be near them under water, that their suckers are applied upon wood, stone, and even upon glass, and porcelain, and deposit a mucous matter there which communicates to these bodies the same burning property possessed by the tentacula themselves.

SUPPLEMENT

ON

THE POLYPI.

IN the fourth class of this great division, the first and most extraordinary animals we meet, are the *ACTINIÆ*, vulgarly known by the name of *sea-anemones*, or *fixed sea-nettles*. Their body is fleshy, very contractile, usually remaining fixed upon its base, but able, however, to change place, either by crawling on this same base, or walking upon this tentacula.

When the body of the actinia is the most contracted, it represents a hemisphere, with a small aperture at its summit. Such is the position which these animals retain, when they are stranded, or when the sea is troubled and the sky overcast. But when they are hungry, or the weather is fine, they expand and blossom. The small aperture then becomes as broad as the base, and the body represents a short cylinder. The mouth is at the centre of the superior base of the cylinder, and the whole circumference is furnished with several ranges of tentacula, which represent extremely well in their fine colours and arrangement, the petals of certain double flowers. The mouth conducts into the stomach, which is a sac wrinkled internally, but without any other issue, at least visible, except the mouth. The in-

terval between the stomach, and the external skin of the body, is filled with very singular viscera, which have not been yet sufficiently developed to enable us to communicate a very clear notion of them. Some membranaceous and vertical laminæ proceed from one of its surfaces to the other, like the radii of a circle. They are not of equal height. Their superior edge is furnished with very complicated fringes. There are also found in the interior part of the body, some long, tortuous, and very slender intestines. We do not find in the body of these animals, any thing which can be regarded as nerves or blood-vessels.

Through the experiments of Reaumur, of Baster, and more especially of Dicquemare, the history of these animals has become extremely curious. Their multiplication takes place in two ways; the first is natural, and consists in a spontaneous dilaceration of a portion of the ligaments of the base, which is performed by the constriction of this part. Then may be observed, escaping by this dilaceration, one or several small portions of the animal, which in a little time become new actiniæ of the same species as that of which they had composed a part. Dicquemare obtained an artificial multiplication, at least equally singular. He separated some parcels from the base of an actinia, and beheld them almost immediately form so many new animals.

In the month of May, 1772, Dicquemare cut off all the tentacula from an actinia, and in a short time after they rebudded. He cut them afresh on the 30th of July following, and they were reproduced in the same way in less than a month. An actinia cleft through the middle of the body, appeared, after the end of some months, as completely organized as before it was mutilated. These experiments, and many others, the detail of which might prove tedious, demonstrate in a positive manner the faculty possessed by the actiniæ of reorganization in their destroyed parts.

Their food consists of small mollusca, shrimps, little crabs, and medusæ. They seize them with their tentacula, keep them in the interior of their body for ten or twelve hours, and subsequently void through the same aperture the solid parts which they have been unable to digest. In the sea-water, they can support very long fasts. It has been observed already that the more hungry they are, the more they dilate their aperture; it sometimes even happens that they turn their stomach altogether, and render it convex, instead of concave, as it was before. They perish directly in fresh water. They are found attached by the base. When the animal is desirous of changing place, it possesses several methods of exercising this movement. It either slides slowly upon its pedicle, or, detaching its base altogether, it swells itself with water, and then becoming almost as light as the volume of water which it displaces, the least agitation is sufficient to impel it further. When it wishes to fix itself, the body contracts, the water escapes, it proceeds to the bottom, and its base becomes glued to the surface of the first body within its reach. Though no organ of vision is observable in these animals, a strong light evidently incommodes them. They appear strongly affected by it. Dicquemare has observed that those actiniæ from which certain parts were abstracted, were more sensible to the glare of light than they had been before they were mutilated. Severe cold does not annoy them. They may be enclosed in a piece of ice, left there all night, and on the following day they shall be found alive. Placed under a pneumatic machine, they support the effects of the vacuum without inflating themselves, and without appearing in the least degree exhausted when the air is restored to them. Dicquemare has made some further observations which may prove useful to mariners. He perceived that all the changes of weather were announced by some extraordinary movements in the actiniæ which he brought up;

and he arrived at this result, that the movements of these animals were in accordance with those of the barometer.

The actiniæ possess no maleficent quality, and are eaten in several countries.

Dr. Spix has given some very curious details respecting the organization of these animals, which he observed and dissected upon the coasts of the channel.

In considering the gelatinous polypi, we shall confine our remarks chiefly to the HYDRA.

The hydræ are animals exceedingly simple, which we can scarcely compare to any thing but filaments of small thickness, fixed at one of their extremities, by means of a sort of sucker, and provided on the other with a crown of cirrhi, or tentacula, more attenuated than the finest hairs, to the number of ten or more, and possessed of extreme contractility. This disposition of the tentacula and even their uses, caused these little animals to be compared to the polypi of the ancients, now denominated *octopus*, and occasioned Reaumur to give them the name of polypi. The structure of the different parts of the body of the hydræ is throughout completely uniform. In fact, we discover in them, even with the assistance of the microscope, nothing but a sort of parenchyma, formed of globules, and cellular tissue, and which is capable of contraction, particularly in the tentacula, to such a degree as to disappear almost completely. Accordingly, the general sensibility of these animalculæ is exquisite, so that they can feel or perceive the light, and distinguish it from the shade; not that we would be understood to say with some writers, that they actually possess the power of vision, through the medium of the general envelope; but they are in the predicament of plants, which direct themselves towards the light, the effects of which they experience, without otherwise perceiving the bodies which transmit it. The hydræ have no traces of the

organs of sensation, except that of touch, which is perfect in the tentacula, with which the mouth is armed. All the parts of their tissue are capable of contraction, but without any possibility of our perceiving in them distinct muscular fibres. The hydræ are, however, capable of changing place altogether, and they do so after the manner of the geometrical caterpillars, and of some leeches. Most frequently, however, they remain fixed by the posterior extremity, and extend, more or less, their body and tentacula in the different directions necessary for seizing their prey. They feed upon very small aquatic insects, such as monoculi, or naiades. They attract them towards themselves by almost continual movements of the tentacula, enlace them in their numerous folds, agglutinate them by means of some secretion, or some mode of suction, and finally direct them towards the aperture of the mouth, which is in the centre of the circle formed by those tentaculæ. This mouth, which is capable of being dilated into a sort of calyx, communicates into the stomach, which is hollowed in the parenchyma itself, of the body of the little animal, without any distinct parietes, except the skin at the exterior surface. Accordingly, the similitude of the external and internal paries is so great, that Trembley, in one of his most curious experiments, has proved that the little animal may be turned inside out, almost like the finger of a glove, and that digestion and absorption can be as well performed by the external as the internal side. This sort of stomach has no posterior orifice, and when the prey, whether digestible or not, has remained there for some time, it is rejected, in the latter case entire, and in the former such parts are expelled, as were not susceptible of digestion. Hence it appears, that there is no choice respecting the bodies which the little animal introduces into its stomach, and that the stomach alone discriminates by its own action upon them, whether they are suitable

or not. These animals, moreover, can support a very long fast, probably, because they absorb directly from the medium in which they live.

The reproduction of the hydræ is still more simple, if it be certain that it takes place by buds in all parts of the external surface of the body. During the summer, it is said, that a little germ is observed to project from some part of this surface, which enlarges by degrees, and assumes the figure of the mother. Very soon from its free extremity we see likewise the tentacula sprout forth ; and at the end of a longer or shorter time, which depends a little on circumstances, more or less favourable, the young hydra, which, while it was attached to the mother, sought and attracted its prey like her, and fed upon it, ends by being detached from her, and proceeds to fix itself upon some submerged body, where it reproduces in its turn in the same manner. Sometimes it even reproduces while attached to the mother ; insomuch that even eighteen of these animals have been reckoned thus united.

The reproductive faculty of the hydræ, carried to the extent observed by Trembley, must tend to make us believe that this power is extended to all parts of the body. In fact, after the very delicate experiments, but authenticated beyond all doubt, of a philosopher so entirely worthy of credit as Trembley, it is evident that not only the various parts of the body, cut longitudinally or transversely, can reproduce the parts that are deficient, and thus form so many complete animals, often in two days only ; but even sometimes a portion of tentaculum can be developed, and produce a perfect hydra, which Roësel assures us that he has observed.

But it is not only by gemmation, or by artificial or spontaneous scissure, that the hydræ can be reproduced. Jussieu, Trembley, Roësel, and Pallas himself, have observed, that

towards autumn, they eject from their parenchyma some eggs, which fall, are preserved during the winter, and are not developed until spring. It is also said, that the individuals which have their origin in this mode of reproduction, are always smaller than those which have come by gemmation. It has been questioned, however, whether these are in reality eggs.

Thus the history of the hydræ, in considering it as well authenticated, brings to general physiology some considerations of the greatest importance, since it exhibits to us an organized body, composed of a homogeneous tissue, consequently without distinction or separation of organs, not even of skin and muscular fibres, endowed with a very great sensibility, which permits it to feel the light, extremely contractile in all its parts, which can seize small animals of greater resisting solidity than itself, introduce them into its stomach, and digest them ; and that not only with the surface which is habitually digestive, but also with the external surface, artificially become internal. It displays to us an animal, that can graft itself upon another, or by a true continuity of substance, can form, by the union of several individuals, a complex animal, with many heads, thus realizing in nature, the hydra of the fable ; considerations which would lead us to believe that the hydræ are very inferior to the polypi of the madrepores, and to those of the pennatulæ, &c. which are evidently much more complicated in their organization, and that consequently they ought to form the last link of the chain of radiated animals.

Hydræ are to be found in all fresh waters, and in those of the sea, but more particularly, as it would appear, in the first, when they are dormant, providing that be pure. It is during summer that we must look for them, on all bodies submerged in such waters; for, during winter, it seems that they contract themselves and sink into the mud. They may be easily procured by taking a certain quantity of water-lentils, and putting

them into a vessel full of water. After a certain term of repose, the hydræ are observed to begin to move and agitate their tentacula, as in their ordinary position. Trembley, who thus preserved and studied them for several consecutive years, used to feed them with daphniæ, and other small aquatic animals.

The *VORTICELLA* of *Müller*, is a genus concerning which some controversy has existed, as to whether it should be placed with the polypi or the infusoria. The common characters of the animals composing it are, that they are naked, contractile, and provided with rotatory organs. But they present enormous differences, some being binary animals, appendiculated, and very complex, others appearing radiated and very simple.

The organization of the true vorticellæ is much more simple than that of the species retrenched from them by M. de Lamarck. In fact, the vorticellæ exactly resemble a flower of the lily of the valley, supported upon a long filament. This filament is cylindrical, and a little enlarged at its terminal part. The body itself is formed like a small purse or monopetalous flower, having its edges widened, and provided with groups of short and very fine ciliæ, opposed laterally, which should make the vorticellæ binary animals. When these little beings are in their state of complete development, they are attached to some submerged bodies by the extremity of the pedicle, this part being extremely stretched, as well as the body, at the anterior of which the two fasciculi of ciliæ are agitated with great rapidity. From this action results a sort of double vortex, or whirlpool, which separates, or drives out, the extremely fine molecules which are found in the ambient fluid, and which is regarded as serving to direct the prey towards the buccal cavity. On the least shock, these little animals contract themselves quickly, undulating their pedicle, which being fixed, serves them as a point of rest.

At other times they are observed to detach themselves spontaneously, and swim, drawing after them their pedicle extended in a right line. Finally, they sometimes fix themselves by the enlarged part of their body, and appear to move by means of their appendages. This is chiefly observed in individuals whose pedicle is short, or even nothing, which is the case with the *urceolariaæ*.

It appears that there are vorticellæ attached one upon the other, so that they seem to constitute composite animals.

The vorticellæ, properly so called, multiply by natural sections, the body dividing by little and little in the middle, in such a manner, however, that the pedicle remains to a single individual. The promptitude with which this scission takes place is in proportion with the state of the external temperature, so that in fine weather, the multiplication of these animals goes on with wonderful rapidity.

On the approach of winter, they produce oviform germs or buds, which are preserved in the water during the whole of this season, and are developed in spring.

The vorticellæ particularly live in fresh and stagnant waters, fixed upon all the bodies which are to be found there.

Müller has observed that the mode of generation in the species called *V. racemosa*, is altogether peculiar. An adult individual fixes itself upon some body. Then from its own body, or at the base, germinate eight similar bodies, which, in a few hours, are raised upon their own proper pedicles. In a short time, each of these new bodies gives birth to eight others, which provided in their turn with their pedicles, go on *seriatim* to propagate in the same manner. During this time the pedicles of the first and second order cross like the branches of a vegetable. As to the pedicle of the mother, and which supports all the others, it preserves the same length.

Previously to taking a short review of the principal groups of the CORALLIFEROUS POLYPI, &c., it may not be unnecessary to say a few words in general on the bodies more or less solid, with which these animals are united, and which are now generally termed by naturalists *Polyparia*. This term, of very general, perhaps too general an extension, may be thus defined. A polyparium is a fixed envelope, more or less solid, calcareous, or corneous, in which a polypus resides, and which is the evident result of a transudation from its body of an excretion through certain pores of its skin, of matters sufficiently composite to form, by their approximation, a concrete body more or less solid, and altogether inorganic. This definition, however, is strictly applicable only to the madrepores and escharæ of Linnæus, and is not equally so to the other divisions. Therefore, if we persist in generalizing this name, it will be necessary to define it as a solid, calcareous, or corneous, the residuum of one or several polypi, without any attention to its mode of formation, or the manner in which the polypi are placed there, and then the fibrous mass of a true alcyon, the fleshy mass of a pennatula, the corneo-calcareous lamina of an eschara, the plant-like stems of cellaria and sertularia, the calcareous, arborescent, frondescent masses of the madrepores, will be equally polyparia. We may even add to these the beautiful tufts of the corallina, on the supposition that they support polypi, which, however, is by no means clearly made out.

In considering the nature of polyparia, we find them to be of several sorts, according as they are calcareous, or stony, corneous, fibrous, corticiferous, gluey, or fleshy.

The CORALLINES form a genus of organized bodies, on the nature of which, although it is very common in all the seas of Europe, and has for a long time been employed in therapeutics, authors are by no means agreed, some regarding it as appertaining to the vegetable, and some to the animal

kingdom ; but our limits forbid us entering into this question, or adding to the statement of the text, however brief, any thing beyond the observations of de Blainville, who says, that notwithstanding all the pains he bestowed in observing corallines in the shade, or in the sun, or in the small holes of rocks filled with water some time after the sea had retired, with a very strong microscope, he was never able to discern the least trace of animals, or even of filaments which might issue from them. If, after having viewed the exterior of a coralline, we come to study the internal structure, we shall not find, as some authors say, that it is a fibrous corneous axis, surrounded by a calcareous crust, but on the contrary, that it is a sort of cellular tissue, in the meshes of which the calcareous matter is deposited ; and in fact, when we put a coralline into a weak acid, it is softened absolutely like a bone, without being diminished in volume, without assuming another form, or even changing colour. All this causes M. de Blainville to doubt that the true corallines can be formed by distinct polypi. But he puts the query—is the coralline really a vegetable ? On this point he is by no means assured, although all the Italians, who have been the principal observers of these sorts of bodies, appear to be perfectly convinced that it is.

Every one knows that under the name of CORAL (*Corallium*) is commonly understood a sort of arbusculum, more or less branched, stony, calcareous, sometimes of a fine red colour, sometimes more or less roseate, or even altogether white. It has been employed from time immemorial in the manufacture of toys, and other objects of ornament, and it gives rise to a fishery and trade of great extent in different parts of the Mediterranean.

The polypi which inhabit the cellules of the surface of the coral, are very soft, altogether white, and not very transparent. Their body, or belly, is cylindrical, and entirely concealed in

the cellule, to which, doubtless, it is adherent by its extremity, which appears to be continued with the vessels of the fleshy and common envelope. This at least is the opinion of M. de Blainville, who finds it on a supposed analogy with the pinnatulæ, which he has dissected. Donati, however, tells us expressly that it is entirely detached and separate. Be this as it may, the body of the polypus is terminated by eight appendages, disposed in radii round the mouth, or an aperture which Donati informs us is made by a shell, a little widened at its root, with a large aperture at the summit, and hollowed by eight broad furrows, between each of which arises a sort of ridge. Between two of these elevations, is placed one of the tentacular appendages, which are thus upon the same plane. They are all perfectly equal, conical, a little compressed, and provided on each side with appendages, or barbles, regularly decreasing from the base to the extremity. Donati adds, that he has seen at the inferior part of the body of some polypi, some little hydatiform bodies, rather round, extremely small, soft, transparent and yellowish. He thinks, with reason, that these are the eggs, or reproductive corpuscula.

The coral lives in the Mediterranean sea only at considerable depths, though rather variable. The coral seems to require at least ten years to render its growth complete. Propagation takes place thus: the eggs, or reproductive corpuscula, rejected through the mouth of the animal, or rather, perhaps, through the orifices which are at its margin, fall upon some body, and adhere there by their soft and gelatinous nature. They extend a little, and begin to grow, particularly at the part in contact, which enlarges, and moulds itself on the submarine body. From the middle of this sort of coral-drop, rises a tubercle, in which are evidently seen an interior cavity, and eight wrinkles, or plates at its superior part, but without aperture. The polypus, in its interior, is as yet but

in the state of foetus, but it attains its growth successively. All the parts become developed, and it is then that the capsule opens, to permit it to put forth its tentacula, to seize its nutriment, and perhaps to respire. The growth of the central part then becomes more rapid. It deposits calcareous matter in the middle. It sprouts more and more, and is developed by means of new polypi in indeterminate points, so that one might say that the polyparium is almost totally independent of the polypus, and that its hard part, or axis, is always softer towards the extremities of the branches, than at any other place.

Chemical analysis has proved that the coral, or at least its axis, is entirely composed of carbonate of lime, for it completely dissolves in nitric acid.

Imperato was the first writer who made use of the term **MADREPORE** (*Madrepora*) which, in its application by subsequent naturalists, has undergone several modifications. Without troubling our readers with an account of these, it will be sufficient to say that the name is now reserved to certain lamelliferous tree-like polyparia, the surface of which is bristled with projecting cellules. Their classification is unfortunately based only on a knowledge of the polyparium, or cretaceous mass produced by the animals, for of the latter, very little that is satisfactory has been ascertained. Imperato was the first who suspected that the madrepores of Linnæus belonged to animals. Rumph, who had occasion to observe a great number in the Indian seas, confirmed this opinion, but he observed in them nothing but a sort of animal jelly covering the polyparium. Finally, Peyssonel removed all doubts upon this subject, and to Donati and Cavolini, we are most indebted for any details respecting the species.

Of the madreporæ thus defined, none are known in the seas of Europe, and hitherto they have been met with only in those of South America and India. Fixed by their base at

considerable depths, they elevate more or less their foliaceous expansions. We are totally ignorant of their mode of growth, multiplication, and death. We merely know that the polyarium, which is entirely calcareous, is of a closer tissue, near its base, and that, on the contrary, the extremities of the ramifications are always more porous. The inferior cellules are always more effaced, (the reverse is the case with the upper) and the extremity of the branches is often terminated by an infundibuliform excavation tolerably deep.

It is said that the formation of the numerous reefs in the South Seas, the Indian Ocean, and the Red Sea, is owing to the very rapid growth of the madrepores, and particularly of that species called *muricata*. It is certain that most of the islands in those seas rest on a calcareous soil, entirely composed of stony polyparia, and that their highest mountains are thus composed. But it may be difficult to prove that the madrepores are the species which are found there in the greatest number. On this subject we are deficient in positive observations.

PENNATULA is a genus of true zoophytes, established by Linnæus for a set of animals extremely singular, whose form in the most common species resembles that of a quill, from which its name is derived. These animals are composed of a common part, or stem, most generally containing in its exterior a long calcareous stick, and a certain number of polypi disposed in rather a fixed manner upon a part of the stem, or on some appendages which are added to it, and which constitute the barbs of the quill. To these species modern zoologists have reserved the name of pennatula.

Without following naturalists in a very detailed description of these animals, we may say in brief, that a pennatula is a body of a determinate form, binary, symmetrical, composed of a muscular contractile tissue, most frequently supported by a solid calcareous part, produced by a particular membrane,

and of an areolar tissue, as it were spongy, susceptible of a sort of erection by the introduction of an aqueous fluid; a body with which is in organic communication a considerable number of little animals, each having a buccal orifice, surrounded with a rank of pennated tentacula, and an oviferous sac, developed in the tissue itself of the pennatula.

The physiological phenomena which the pennatula presents is extremely interesting, since it exhibits the example of a truly composite animal, that is, one in which animals, more or less in number, really perfect as far as comports with the grade of organization to which they belong, form part of a common, living, contractile body, serving as an intermedium both for locomotion and nutrition to all the individuals, so that they are all carried together by the sole movements of the common part, without the particular movements of each occasioning any obstacle, and they are all nourished in a mediate manner, by means of this common portion of which they form a part. The nutriment which favourable circumstances have placed within the reach of one individual, nourishes that individual first, and then by extension, nourishes the common stem, and thus the other polypi, which constitute organic portions of it, receive their share.

It is rather more difficult to conceive the mode of growth in the pennatula, and its mode of reproduction. In all the aggregate polyparia, as the madrepores, the growth proceeds by the extremities, and consequently, very probably, by the adherence of the gemmules, produced by the terminal polypi, to the lodge of the latter. The accidental fall of these gemmules gives birth to new individuals. In the first case, we must consider it rather an accumulation, than a true growth; and, in fact, there is a real death of all that is below the extremities. It cannot be so in the pennatula, which is a terminated and finished whole, so that we must believe that the growth here is really individual, at least in the common part.

As for the composing polypi, each of them, without doubt, must grow. But the truth is, all is conjecture here, nor is our knowledge of the habits of the pennatulæ at all adequate to assist us in throwing light on these very difficult points of physiology.

The pennatulæ, as it seems, live constantly in the high seas, and are always floating. Although they are in a continual movement of systole and diastole, somewhat like the medusæ, which is produced by the contraction of the inflated and posterior part of the animal, and especially by the *winglets*, or polypiferous branches, it is not probable that they possess the least power of directing themselves in the interior of the waters. They are altogether under the influence of the currents, like the medusæ themselves. Still less is it admissible that the composing polypi can conspire together in their movements, to direct themselves in determinate tracks. This is an hypothesis which defies conception, nor is the object of such a faculty at all perceptible. Each polypus acts independently of its neighbour, and the object of the motion of its tentacula, is only to seize the little animals which may come within its reach.

Pennatulæ have been observed in every sea, but their known species are not numerous.

We shall dismiss the consideration of this class, with a notice of the Sponges (*spongia*).

This is a group of organized bodies, extremely extended in every sea, but particularly in those of warmer climates. They have been known since the remotest antiquity, and, nevertheless, naturalists are far from being agreed with respect to their true character. Some will have them to be vegetables; others a wholly simple animal; and several, polyparia, of which the animal is unknown. All the authors of antiquity allowed them a sensitive life, and admitted that the living sponges seemed to avoid the hand which would touch them,

and that they appeared to adhere more closely to the submarine rocks, the greater the efforts that were made to detach them. They considered the sponges to be organized bodies, intermediate to vegetables and animals, such as they subsequently named zoophytes. This opinion was maintained for a long time, and gained the assent of most of the Italian writers, Spallanzani, Olivi, &c. some of whom, however, granted a higher degree of animality to these productions. Rondelet seems to have been the first who utterly refused all sensibility to the sponges, and denied the fact mentioned by Aristotle, above alluded to. From this an hypothesis arose, that they were only vegetables, and it was adopted by Tournefort, by many ancient botanists, and by Linnæus himself, in the first editions of his *Systema Naturæ*. Such, for a time, was also the opinion of Spallanzani, as far as some species were concerned, because he observed in them no signs of contractility. The third opinion, which was Peyssonell's, is that sponges are sorts of polyparia, fabricated by animals found in their excavations. But as this could not be supported, as these animals have no adherence with the sponges, and are often of totally different species, this hypothesis was modified by pronouncing the sponge to be a polyparium, the polypi of which are unknown.

If naturalists still hesitate respecting the nature of the sponges, it is, doubtless, because they have no sufficient notion of their organization. Without touching on the merits of the controversies concerning them, we shall lay before our readers all that is known upon the subject.

Every one agrees that the sponges are generally formed of at least two substances; the first, interior, more or less corneous, fibrous, intercrossing in all ways, and forming a sort of felt-like tissue, more or less compact. It is this which attaches the sponge to the submarine bodies; the second, soft or gelatinous, enveloping the preceding, forms a sort of general

stratum, which is the seat of sensibility and life. Olivi tells us that there are species of sponges, which present three very distinct substances. 1. The fibrous matter which forms the support, or as it were, the skeleton of the sponge. 2. The mucous gelatinous substance, surrounding the fibrous parts; and 3. A terrene matter, mingled with the preceding, and forming a sort of cortical substance, which surrounds the gelatine itself. According to Father Vico, however, the organization of the sponges is much more complicated, and he would fain discover in them, a muscular and a nervous system, ovaries, seminiferous vessels, &c. As this opinion, however, seems wholly untenable, it is unnecessary to dwell on the details on which it is founded. Olivi, whose opinion is more probable, regards the fibres, not as very important organs, but as the support, or frame-work of the living body, and the sort of marrow, which is sometimes found in their interior, he supposes to have originated at the period when the animal was young. He thinks that the mucilaginous and cortical envelope really constitutes the animal, but that this animal is amorphous.

Sponges are considered by M. de Blainville, after Pallas, Cavolini, Olivi, Donovan, &c., as organized bodies, intermediate to the two organic kingdoms, without any regular determinate form; presenting an absorbent surface having some obscure traces of feeling, nourished by the molecules from the surrounding medium, pretty nearly like vegetables. Reproduction takes place by a sort of pullulation, or scission of the living or gelatinous matter.

The sponges are always adherent to submarine bodies, of whatsoever nature they may be, at variable, though always considerable depths, and consequently, in places where the sea is tranquil. They are particularly to be found in great abundance in the excavations of rocks. It is certain, however, that some species can exist in places covered and left bare

successively by the sea, as is the case in our northern seas. Some of them attain great dimensions, having been found more than three or four feet in height. We are not exactly acquainted with the duration of their life, nor with the degree of rapidity in their growth ; but we must conclude that they grow promptly if it be that they can be fished for, with success, after the second year, in places which had been previously exhausted of them. The sponges are very common in the seas of warmer climates, where they attain the largest dimensions. They are less so in those of temperate regions, and finally, as we approach the ices of the north, they become more and more rare, and smaller, and utterly disappear near the polar circle.

SUPPLEMENT

ON THE

INFUSORIA.

ON these curious beings, of which so little is known, and whose place in the living series is so far from being determined, we cannot pretend to offer any thing more than a few general observations.

The denomination of **INFUSORIA**, was introduced into zoology by Otto-Frederic Müller, to designate a class of animals which are developed in vegetable or animal infusions, and which, from their extreme smallness, have also been named microscopic. All systematic authors since Gmelin, have adopted the division and the name, though some have rather restrained its application, and others, in admitting it, have observed that it was very badly circumscribed. In fact, Müller was guided by no principle in the establishment of this class, and it is therefore probable that it contains an anomalous assemblage of animals of degrees of organization, or types, extremely different, and equally different degrees of development. The only common characters which they possess, if characters they can be called, are their extreme littleness and transparency, which render them appreciable only by the microscope; their constant habitat in a fluid,

which is a consequence of their littleness, and their not being developed for the most part, except in vegetable or animal infusions, which, however, is as yet but doubtful. Their general and particular form, the only thing which an observer can seize, confirms the differences in their organization. In fact, there are some whose form is truly binary and symmetrical, not only in their body, but also in the appendages attached to it, and which, besides, are clothed with a true cornaceous envelope. Some have the body elongated, vermiform, or depressed symmetrically, without any trace of appendages, as the vibrio, &c. Others, on the contrary, have a form evidently radiated, with a mouth or cavity apparent, as most of the vorticellæ which we have seen are transferred by the Baron to the preceding class. Finally, there are some whose body is amorphous, or without any determinate form susceptible of definition, without buccal aperture, or trace of appendages, as the proteus, the volvox, and the monads. Those of the first sort are true animals, and even very elevated in the scale, since we find in them locomotive appendages, very distinct, which have been denominated wheels, filaments, &c.; a tail composed of several articulations, and often terminated by appendages, variable in form and number; a true cephalothoracic buckler, covering a trunk more or less distinct; even a heart, eyes, and ovaries, have been remarked, and consequently we cannot doubt that these animals are provided with an intestinal canal. These animals thus exhibit some relations with those crustacea called *entomostraca*, by Müller, and it is no very improbable conjecture, that some of these infusoria of this first section, may be only degrees of developments of species of entomostraca, well known in the adult state, for some of them are susceptible of very distinct metamorphoses, as has been proved by M. de Jurine, in the nauplia and amynome. As for the second form in the infusoria, which is seen in the vibriones, we may conceive that it

might appertain to animals of the class of apod worms, since the body is elongated and symmetrical, without any visible articulations, and certainly without any appendages ; but it would be too much to assert this as certain, since observers say nothing of an intestinal canal, nor consequently of mouth or anus. Still the numerous movements of these organized bodies in determinate directions, will not permit us to doubt of their animality. It is the same with the vorticellæ, of which we have spoken elsewhere, and which, though long ranked here, have a great analogy with the hydræ or polypi. There remain then the protei, and the volvoces, which we cannot refer to any known type. They, in fact, are organized bodies, without any determinate form, without any distinct organ, being nothing but a small mass of cellular tissue, in the meshes of which are contained fluids, and which is hardly condensed at the circumference to form an envelope, so that all the functions in these bodies, are reduced to immediate absorption of molecules, already prepared in the ambient fluid, and to exhalation. This may be considered as the term, the last link of animal life, where no organ is distinguishable.

Be this, however, as it may, it clearly appears from what has now been said, that the class of the infusoria is totally inadmissible, because it contains animals of very different types. This, indeed, could not have been recognized previously to the establishment of the principle, that the general form of the body carries with it a determinate degree of organization, for in such little animals it is almost the form alone that can be perceived. Thus we may consider that the genera brachion, urceolaria, cercaria, furcularia, kerone, trichocercus, and himantopus, really belong to the type of articulated animals, and particularly to the class of heteropods, order entomomostaca. Many species of vibriones may be regarded as apod worms, and likewise the genera paramecia, and kolpoda ; the rest of the vibriones, the cyclides, and, perhaps, the leucophes,

should come near the planaria. The true vorticellæ we have seen to be polypi. Finally, the genera gonium, proteus, volvox and monads, if they can be certainly regarded as animals, ought, in the opinion of M. de Blainville, to form a distinct type, to which he gives the names of *amorpha*, and *agastraria*, which are intended to express that they have no determinate form, and that the external envelope does not turn into or form a stomach, as in all true animals.

Though many first rate naturalists, such as Leuwenhoek, and Spallanzani, have occupied themselves with the infusoria, it is much to be wished that such labours were renewed with juster views, and more scientific exactitude of observation. Many things, no doubt, would be found to require rectification, and the result would be important, not only to zoology, but to general physiology. Many authors, admitting too generally that these animals are born in vegetable or animal infusions, have taken occasion from this position to maintain the doctrine of spontaneous generation, and several other notions, more or less erroneous. From some remarks on the last of the infusoria, the generation from spontaneous scission in the parent, in whose body gemmules might be formed, has been also admitted. This from analogy is more probable; but it would be well, if possible, to ascertain that it were true. The greatest care should be taken in observation to avoid the errors which the instrument we are forced to use may lead us into.

Erratum in title of third order of Polypi.

For polypi polypiferi, read polypi with polyparia.

ALPHABETICAL LIST

OF THE

FIGURES OF MOLLUSCA*.

PL. FIG.

7. 3. *Acasta spinosula*, *Des.*
Hyaline, valves tubercular near the lips.
7. 4. *Acasta Montagui*, *Leach.*
Ashy white, valves lanceolate.
27. 5. *Achatina Mulleri Féruccac.*
Pale brown, with deeper streaks.
2. 1. *Anatifa lœvis*, *Lam.*
Nearly white.
12. 3. *Anatina hispidula*, *Cuv.* (*Lanternia*, *Lam.*)
Ashy, with white spots, shells very thin.
22. 3. *Anatina elliptica*, *King.*
Nearly white, striated.
32. 13. *Ancillaria cinnamomea*, *Blain.*
Cinnamon colour.
37. 9. *Ancillaria Australis*, *Sav.*
Light yellow, with ashy spots.
19. 3. *Anodon Georginae*, *Gray.*
Varied, purple red, shell solid, smooth, covered with a thickish olive coloured periosteum.
Rivers of Paraguay.
24. 1. *Anodon Susannæ*, *Gray.*
Shell thin, covered with pale olive coloured periosteum.
From South America.
24. 2. *Anodon tenuis*, *Gray.*
Periosteum sea green.
39. 6. *Anomia ephippium*, *Lin.*
Smooth, silvery, thin, varies

PL. FIG.

- in shape with the substance it is attached to.
10. 6. *Aplidium lobatum*, *Sav.*
Pale brown.
39. 12. *Arca granosa*, *Lam.*
White, with transverse tubercles.
5. 3. *Argonauta argo*, *Lin.*
(The animal is crythoë antiquorum, and has no muscular attachment to the shell.) Shell white, animal brownish.
35. 1. *Arion Empiricorum.*
Black, with cross lines.
7. 6. *Asemus porosus*, *Cuv.*
Purple.
8. 7. *Aspergillum vaginiferum*, *Lam.*
Ash coloured.
27. 8. *Auricula Midæ*, *Lam.*
White, covered with brownish periosteum.
39. 2. *Avicula heteroptera*, *Lam.*
Brown.
7. 1. *Balanus ovularis*, *Lam.*
White.
7. 2. *Balanus sulcatus*.
White.
18. Bivalve shells, terminology of.
9. 10. *Boltenia ovifera*, *Sav.*
Pale brown.
10. 1. *Botryllus polycyclus*, *Sav.*
Pale ash colour, with green spots.

* Most of the inedited shells figured in this work are from the collection in the British Museum.

PL. FIG.

27. 1. *Bulimus Guadalupensis, Ferus.*
White, with brown bands.
37. 7. *Bulimus auris-vulpina, Gray.*
(*Struthiolaria arcuata, Lam.*)
Pale yellow, with light band.
St. Helena.
37. 8. *Bullaea semiplicata, Gray.*
Pale buff, upper lip and
suture callous.
12. 6. *Byssomia pholadis, Cuv.*
Whitish, with a pale thin
periosteum; siphon large,
pale pink.
6. 8. *Calpurnus verrucosus, Mart.*
(*Ovula verrucosa, Lam.*)
White and pink.
32. 11. *Cancellaria asperula, Des.*
White.
38. 3. *Cardium fimbriatum, Lin.*
Ashy.
39. 10. *Cardita caliculata, Lam.*
White, spotted with black.
32. 8. *Cassis decussata, Lam.*
Brown, with darker bands
or spots.
32. 9. *Cassidaria echinophora, Lam.*
Whitish, shell thin.
11. 6. *Catillus Cuvieri, Brongn.*
Fossil.
13. 1. *Cerithium læve* ¹, *Gray.*
White.
New Holland.
14. 1. *Cerithium zonata, Lam.*
Blackish, with white band.
14. 4. *Cerithium truncatum, Lam.*
Yellowish ash.
38. 5. *Chama crocea, Lam.*
Shell orange colour, sub-
spinose.
27. 9. *Chondrus avenaceus, Cuv.*
Pale brown.
7. 10. and 11. *Chthamatus stellatus.*
Dirty white.
2. 6. *Cineras vittata, Leach.*
Dark ash, with black bands.
8. 6. *Clavagella coronata, Lam.*
Fossil.
37. 6. *Clavatula Griffithii, Gray.*
Fusiform, solid, ashy,
spirally striated, whorls
rounded with a subpos-
terior dark band, inter-

PL. FIG.

- rupted by whitish tuber-
cles.
9. 13. *Clavellina borealis, Sav.*
Pale ash.
27. 6. *Clausilia inflata, Lam.*
Pale ash.
3. 8. *Cleodora lanceolata.*
Hyaline.
3. 1. *Clio borealis, Lin.*
Dirty white.
37. 1. *Columbella Tyleræ, Gray.*
White, with black lines,
leaving square white
spots; front transversely
striated, white and brown.
37. 2. *Columbella harpeformis, Sow.*
Dark ash.
41. 3. *Columbella suturalis, Gray.*
Blue and brown.
32. 7. *Concholepas Peruvianus, Lam.*
Dark brown, inside white.
7. 1. *Conia radiata.*
Ashy white.
27. 13. *Conovulus fasciatus, Des.*
White, banded with brown.
6. 1. *Conus Caledonicus, Lam.*
Fulvous, with spiral lines.
6. 2. *Conus bandanus, Lam.*
Black, with triangular white
spots.
6. 3. *Conus tendineus, Lam.* Blue.
7. 13. *Coronula balænaris.*
Greenish white.
4. 5. *Crania personata, Lam.*
Fossil.
7. 9. *Creusia spinosula.*
Hyaline.
11. 3. *Crenatula avicularis, Lam.*
Brown, with narrow pale
rays.
3. 9. *Creseis virgula, Rang.*
Hyaline.
41. 1. *Cryptostoma Javanica, Gray.*
White.
3. 10. *Cuvieria columnella, Rang.*
Hyaline.
28. 1. *Cyclostoma articulata, Gray.*
White, spirally grooved with
brown dots, umbilicus
deeply grooved.
28. 3. *Cyclostoma pulchrum, Gray.*
Pale brown, with inter-
rupted, brown, radiated
streaks.

¹ Erratum in the plate, Del. *truncatum*, lego *læve*.

PL. FIG.

28. 4. *Cyclostoma Madagascieusius*,
Gray.
Whitish, with narrow brown
spiral lines.
28. 5. *Cyclostoma auriculare*, Gray.
White, apex reddish.
41. 2. *Cyllene Owenii*, Gray.
This shell in general appear-
ance is assimilated to
Buccinum, but it has a
groove over the suture, as
in *Oliva*, and a sinus in
front of the outer lip, as
in *strombus*. Mr. Gray
has, therefore, separated
it generically.
3. 2. *Cymbulia Peronii*, Cuv.
Blueish white.
9. 11. *Cynthia momus*, Sow.
Rose coloured.
6. 4. *Cypraea stolidia*, Lam.
Pale, fulvous, teeth yellow.
6. 5. *Cypraea pediculus*, Lam.
Animal.
20. 2. *Cyrena similis*, Gray.
Periosteum olive green, la-
teral teeth long.
19. 1. *Cytherea Dronia*, var.
Pale pinkish white.
Note.—This seems to be *Cy-
lunaria*, of Lesson.
7. 15. *Diadema Coronula Diadema*.
Dirty yellow.
32. 10. *Dolium perdix*, Lam.
Brown.
38. 9. *Donax hilarella*, Valenc.
Yellowish grey.
32. 1. *Eburna spirata*. White.
5. 2. *Eledone moschatus*, arm of.
4. 8. *Etheria elliptica*, Lam.
Ashy, with yellowish spots.
10. 5. *Eucclium hospitiolum*, Sauv.
Pale reddish.
3. 12. *Eurybia hemispherica*. Hya-
line.
41. 7. *Fasciolaria trapezium*, Lam.
Brown, with darker spiral
lines.
8. 3. *Fistulana gregata*, Lam.
Dirty white.

PL. FIG.

33. 3. *Fusus morio*, Lam.
Purple black, with a pos-
terior pale band.
38. 7. *Galathea radiata*, Lam.
Covered with clive perios-
teum.
3. 4. *Gastrochæna cuneiformis*, Lam.
Dirty white; shell thin.
11. 4. *Gervilia solenoides*, Defrance.
Fossil.
31. 2. *Glauconeome Chinensis*¹, Gray.
White, covered with a pale
green periosteum.
12. 4. *Glycimeris siliqua*, Lam.
Dark green.
32. 5. *Harpa ventricosa*, Lam.
Pink, varied with brown
and yellow.
27. 7. *Helix corocolla*, Lin.
Animal reddish, with three
blue bands along the back.
28. 2. *Helix argillacea*, Gray.
Clay coloured.
36. 1. *Helix mora*, Gray.
Chestnut brown, edge of lips
white.
36. 4. *Helix Cunninghami*, Gray.
Pale, with broad bands.
New Holland.
36. 5. *Helix Lamarkii*.
Pale, with broad brown
bands.
36. 2. *Helix viridis*, Desh.
Green, banded with black.
36. 6. *Helix Fraseri*, Gray.
Pale, with many unequal
plain bands.
New Holland.
43. 10. *Hippocrenes macropterus*.
Reddish ash.
3. 6. *Hialea globulosa*.
Dirty white.
3. 7. *Hialea trespinosa*, Leseur.
Dirty white.
12. 7. *Hiatella arctica*, Bosc.
Whitish.
11. 5. *Inoceramus sulcatus*, Cuv.
Fossil.
3. 5. *Limacina helicina*, Cuv.
Dirty white.

¹ This is named by mistake on the plate *Glycemeris Apineusis*.

PL. FIG.

39. 3. *Lima glacialis*, *Lam.*
White; covered with large scales.
 35. 2. *Limax variegatus*, *Lam.*
Brownish yellow.
 4. 1. *Lingula anatina*, *Cuv.*
Shell green, animal ashy.
 1. 3. *Littoraria pulchra*, *Gray.*
Reddish, with oblique streaks.
 5. 5. *Loligo Brogniartii*.
Brown.
 38. 6. *Lucina Jamaicensis*, *Lam.*
Dirty yellow.
 12. 2. *Lutraria elliptica*, *Lam.*
Ashy.
 27. 2. *Lymneus stagnalis*, *Lam.*
Whitish.

 11. 1. *Malleus vulgaris*, *Lam.*
Black.
 6. 15. *Marginella nubeculata*, *Lam.*
Pearl white, with dark clouded zigzag lines.
 6. 16. *Marginella bullata*, *Lam.*
Pale ash, with dark bands.
 13. 2. *Melania Henriettae*, *Gray.*
Shell thin; pale brown; ribbed, and crossed by tubercles.
 13. 3. *Melania Carolinæ*, *Gray.*
Dark olive.
 13. 4. *Melania lineolata*, *Gray.*
Pale brown, with minute interrupted bands.
 14. 2. *Melania Frethii*, *Gray.*
Black brown.
 14. 3. *Melania quadriseriata*, *Gray.*
Black, whorles flat, with four series of rounded tubercles.
 14. 5. *Melania conica*, *Gray.*
Olive colour.
From Ceylon.
 14. 6. *Melania globulosa*, *Gray.*
Olive; lips white.
 14. 7. *Melania subcarinata*, *Gray.*
Black brown, whorles, with a nodulose keel.
 14. 8. *Melania lœvis*, *Gray.*
Black brown, smooth, with two or three spiral grooves.
 14. 9. *Melania retusa*, *Gray.*
Olive brown, smooth, ovate.

PL. FIG.

14. 4. *Melania lineolata*, in plate, is *Cerethium truncatum*.
 22. 1. *Mesodesma solenoides*, *Gray.*
Pale white, rayed, wedge-shaped.
 22. 2. *Mesodesma denticulata*, *Gray.*
White.
 22. 4. *Mesodesma subtriangulata*, *Gray.*
White, covered with a thin periosteum.
 22. 6. *Mesodesma ornata*, *Gray.*
Pale brown white, with angular red lines.
 40. 2. *Mitra Chinensis*.
Dark olive.
 40. 5. *Mitra orientalis*.
Dark brown ash, obscure striae.
 17. Multivalve shells.
 12. 1. *Mya truncata*, *Lin.*
Reddish brown.

 30. 2. *Nassa Northiæ*, *Gray.*
Reddish brown.
N.B. The specimen is incomplete.
 22. 6. *Nassa reticula*, *Lam.*
Shell dark brown; animal white.
 1. 2. *Natica bifasciata*, *Gray.*
Pale brown, with two narrow bands.
 1. 4. *Natica fluctuata*, *Sav.*
White, with zigzag buff bands.
 5. 7. *Nautilus pompilius*, *Lin.*
Shell white, with brown rays, hinder lip black.
 22. 5. *Nerœa Chinensis*, *Gray.*
White, concentrically grooved.

 7. 12. *Ochthosia Stroemii*.
Yellowish white.
 5. 1. *Octopus Cuvieri*.
Claret colour.
 2. 6. *Olion Cuvieri*, *Leach.*
Pale blue, with metallic reflections.
 6. 12. *Oliva ispidula*, *Lam.*
Brownish white.
 6. 13. *Oliva auricularia*, *Lam.*
Pale grey.
 37. 3. *Oliva tessalata*, *Lam.*, var.
Brown, with dark square spots.
 5. 6. *Onychoteus angulata*, arm of.

PL. FIG.

4. 4. *Orbicula lavigata*, *Blain.*
Horn colour.
39. 1. *Ostrea cristagalli*, *Lam.*
Black.
6. 6. *Ovula triticea*, *Lam.*
Pale pink.
6. 7. *Ovula volva*, *Lam.*
Pale red, spirally striated.

1. 5. *Paludina Chinensis*, *Gray.*
Olive green; mouth with
black edge.
1. 6. *Paludina pulchra*, *Gray.*
Pellucid, with red brown
spiral bands.
36. 3. *Paludina subcostata*, *Gray.*
Olive green.
From China.
12. 5. *Panopaea Aldrovandi*, hinge
of, *Cuv.*
35. 5. *Parmacella Olivieri*, *Lam.*
Dirty ash.
35. 6. *Parmacella palliolum*, head of,
Fer.
31. 6. *Pecten purpureus*, *Lam.*
Purplish white.
39. 5. *Pecten gibbosus*, *Lam.*
Reddish brown.
39. 9. *Pentadina margaritifera*, *Lam.*
Green.
11. 2. *Perna ephippium*, *Lam.*
Purple.
39. 13. *Petricola lucinalis*, *Lam.*
White.
9. 12. *Phallusia nigra*, *Sav.*
Black.
8. 1. *Pholas striata*, (papyracea.)
White.
3. 11. *Psyche globulosa*, animal.
27. 4. *Physa Novæ Hollandiæ*.
Pale brown.
38. 11. *Pinna angustana*, *Lam.*
Yellowish ash.
39. 8. *Placuna placenta*, *Lam.*
Silvery White.
23. 1. *Pleurostoma grandis*, *Gray.*
White with red spots.
23. 2. *Pleurostoma carinata*, *Gray.*
White, whorles keeled.
33. 1. *Pleurostoma Babylonia*, *Lam.*
White, with black spots.
39. 4. *Plicatula cristata*, *Lam.*
Dirty white.
3. 3. *Pneumodermon diaphanum*,
Quoy and Gay.
Dirty white.

PL. FIG.

3. 4. *Pneumodermon Peronii*, *Cuv.*
Dirty white.
2. 2. *Polliceps cornucopia*, *Lam.*
White.
2. 3. *Polliceps mitella*, *Lam.*
Dirty white.
2. 4. *Polliceps scalpellum*.
Dirty white.
10. 4. *Polyclium constellatum*, *Sow.*
Bluish ash colour, with
yellow spots.
32. 12. *Potamis fragilis*, *Brogn.*
Fossil.
12. 10. *Psammothea candida*, *Lam.*
White.
3. *Psyche globulosa*.
Hyaline.
33. 6. *Pterocera scorpio*, *Lam.*
Brown, with reddish brown
streaks.
11. 7. *Pulvinites Adansonii*, *Dep.*
Fossil.
27. 3. *Pupa striatella*, *Fer.*
Ash coloured, striated.
3. 13. *Pyrgo laevis*, *Dep.*
Hyaline.
7. 7,8. *Pyrgona cancellata*.
10. 2. *Pyrosoma rufum*, *Quoy and G.*
Straw colour.
10. 3. *Pyrosoma giganteum*, *Ana-*
tomy of.
25. 3,4. *Pyrula Mawæ*, *Gray.*
Shell deformed. White.
From China.
33. 5. *Pyrula perversa*, *Lam.*
Light ash-coloured, with
brown streaks.
37. 4. *Pyrula striata*, *Sav.*
Pale yellow, with deeper
spots.

32. 2. *Ricinula arachnoides*, *Lam.*
White, with black tubercles.
33. 8. *Rostellaria pes-pelicanii*, *Lam.*
Brownish ash.
9. 2. *Salpa cristata* (*scutigera*) *Cuv.*
Ashy.
9. 3. *Salpa infundibuliformis*, *Quoy.*
White, with ashy lines.
9. 4. *Salpa tricuspidis*, *Quoy.*
White, with ashy lines.
9. 5. *Salpa longicauda*, *Quoy.*
Ash coloured.
9. 6. *Salpa fusiformis*, *Quoy.*
Ash coloured.

PL. FIG.

9. 7. *Salpa zonaria*, *Quoy*.
White, with ashy shadow.
9. 8. *Salpa cylindrica*, *Cuv.*
White, with ashy shadow.
9. 9. *Salpa pyramidalis*, *Quoy*.
White with ashy shadow.
None of these salpæ have
a shell.
12. 9. *Sanguinolaria livida*, *Lam.*
Livid flesh colour.
27. 11. *Scarabus imbrium*
Pale brown.
5. 4. *Sepia officinalis*, *Lin.*
Purplish.
12. 8. *Solen vagina* (*truncata Wood*)
Yellowish.
31. 1. *Solen novacula*, *Gray*.
White, periosteum dirty
olive.
31. 3. *Solen Sayii*.
Pale flesh-coloured.
31. 4. *Solen tenuis*, *Gray*.
Yellowish white.
39. 11. *Spondylus Americanus*, *Lam.*
Reddish White.
4. 3. *Spirifer trigonalis*, *Sav.*
Fossil.
5. 8. *Spirula australis*, *Peron*.
Animal reddish.
25. 5. *Strombus deformis*, *Gray*.
White.
25. 6. *Strombus Campbellii*, *Gray*.
Brown, with obscure bands.
33. 2. *Strombus papilio*, *Lam.*
Black brown.
27. 12. *Succinea rubescens*, *Desm.*
Reddish.
19. 2. *Tellina Guildfordiae*, *Gray*.
White, inside bright yellow.
38. 2. *Tellina linguafelis*, *Lam.*
White, with reddish rays.
6. 9. *Terebellum subulatum*, *Lam.*
White, mottled with brown.
23. 3. *Terebra subulata*, *Lam.*
Reddish white, with brown
spots. The hinder part of
the whorles rounded into
acute keels.
23. 5. *Terebra Africana*, *Gray*.
Pale ash, with central brown
band, and streaked with
brown.
32. 3. *Terebra muscaria*, *Lam.*
White.
4. 2. *Terebratula Gaudichaudii*.
Colour of horn.

PL. FIG.

8. 5. *Teredina personata*, *Lam.*
Fossil.
8. 2. *Teredo navalis*, *Lin.*
Dirty white.
35. 4. *Testacellus haliotideus*,
Reddish ash-coloured.
2. 7. *Tetraesmis hirsutus*, *Cuv.*
Brown.
9. 1. *Thalia cristata*, *Cuv.*
Ash-coloured.
38. 1. *Tridacna gigas*, *Lam.*
White.
39. 7. *Trigonia pectinata*, *Lam.*
Pearly white, varying with
orange, reddish, and purple.
2. 8. *Triton (alepis) fasciculatus*,
Yellow.
41. 4. *Triton Nassoides*.
Spanish white.
23. 4. *Triton iostoma*, *Gray*.
White, streaked with brown,
mouth violet.
25. 1. *Triton turbinelloides*, *Gray*.
Reddish yellow.
25. 2. *Triton elegans*, *Gray*.
White, varied with brown.
37. 5. *Triton vexillum*, *Gray*.
Pale reddish, with bright
orange spiral bands.
1. 1. *Trochus bicarinatus*, *Gray*.
White, streaked with brown.
1. 7. *Trochus Cunninghamii*, *Gray*.
Pale buff, with deeper spots.
7. 14. *Tubicinella balenarum*
Yellowish white.
41. 5. *Turbanella ceratas*.
White, with brown spots.
33. 9. *Turbanella pyrum*, *Lam.*
White, spotted brown.
30. 3. *Turbanella tubercularis*, *Sav.*
White, with brown patches.
13. 5. *Turritella suturalis*, *Sav.*
Brown, with a white spiral
line.
20. Unio Childreni (*unio chinensis*) *Gray*.
Dark brownish periosteum,
teeth small, compressed;
from South America.
20. 3. *Unio Smithii*, *Gray*.
Periosteum dark olive,
disk whitish, varied with
olive.
21. 1. *Unio Leaii*, *Gray*.
Dark ash periosteum; from
China.

PL. FIG.

21. 2. *Unio Douglasiæ*, *Gray*.
Periosteum olive, inside yellowish.
21. 3. *Unio Grayii*, *Lea*.
Dark olive.
24. 2. *Unio tenuis*, *Gray*.
Sea green, inclining to pink toward the apex.
15. Univalve spiral shells.
16. Univalve non-spiral shells.
35. 7. *Vaginula Taunaysii*, *Ferr.*
Dark green, underneath yellowish.
38. 4. *Venus cancellata*.
Pale brown, radiated.
38. 12. *Venus exoleta*, *Lam.*
White.
38. 10. *Venus Danmonensis* (*Cras-*
sina).
Periosteum pale brown.
31. 5. *Villorita cyprinoides*, *Gray*
(*Cyrena cyprinoides*, *Wood*).
Olive green.
35. 3. *Vitrina pellucida*, *Lam.*
Animal ashy, shell green.
6. 10. *Voluta nivosa*, *Lam.*
Brown, with white streaked pale spiral bands.
6. 11. *Voluta Æthiopica*, *Lam.*
Pale brown.

PL. FIG.

26. *Voluta Broderipii*, *Gray*.
Pale yellow, with two bands of angular lines, spire nearly flat.
29. *Voluta Miltonis*, *Gray*.
Pale ash, marbled with brown spots.
From New Holland.
30. 1. *Voluta rufa*, *Gray*.
Clay coloured, mixed with white.
30. 4. *Voluta pallida*, *Gray* (Vol.
Grayii, *Sow.*)
Pale buff, with two darker bands.
34. *Voluta Georginæ*, *Gray*.
Brown, varied in degree.
From Swan River.
40. 1. *Voluta Turneri*
Brownish, with reddish irregular lines.
40. 3. *Voluta papillosa*.
Brown, with deeper patches, and a light transverse band.
40. 4. *Voluta gracilis*.
Dark brown, with zigzag lines.
6. 14. *Volvaria pallida*, *Lam.* (*Mar-*
ginella pallida, *Gray*).
Pale brown, obscurely banded.

END OF VOL. XII.

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